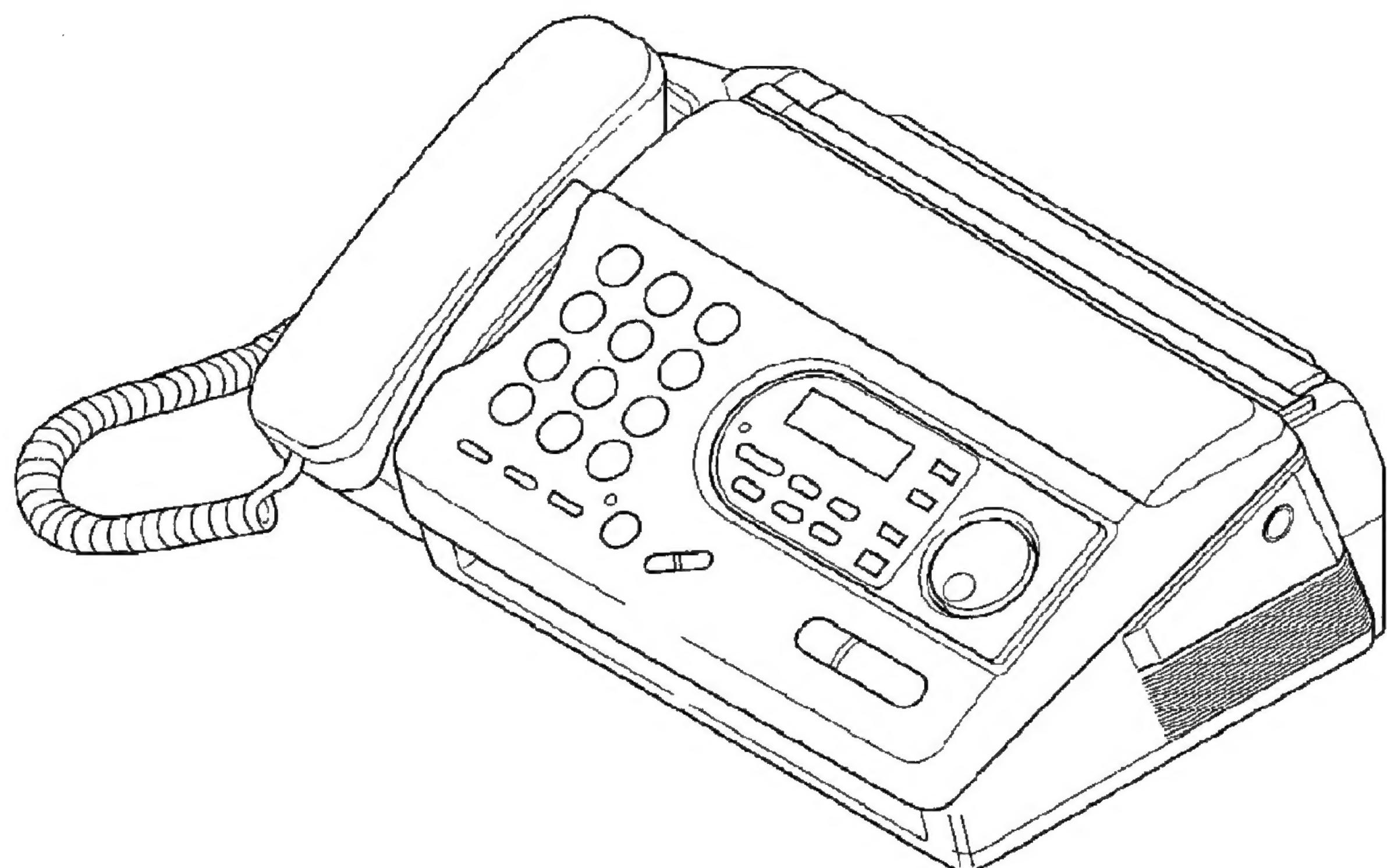


# Service Manual

Telephone Answering System  
With Facsimile

**KX-FT37**



**⚠ WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

**Panasonic**

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**KX-FT37AL**

When you note the serial number, write down all 11 digits. The serial number may be found on the bottom of the unit.

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## **INTRODUCTION**

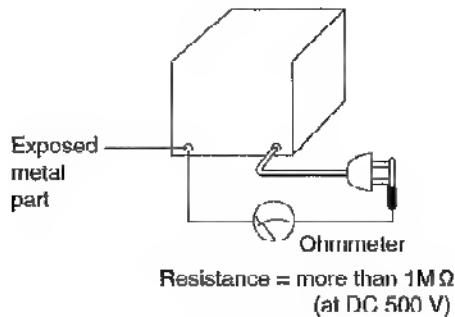
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## SAFETY PRECAUTIONS

1. Before servicing, unplug the AC power cord to prevent an electric shock.
2. When replacing parts, use only the manufacturer's recommended components.
3. Check the condition of the power cord. Replace if wear or damage is evident.
4. After servicing, be sure to restore the lead dress, insulation barriers, insulation papers, shields, etc.
5. Before returning the serviced equipment to the customer, be sure to perform the following insulation resistance test to prevent the customer from being exposed to shock hazards.

## INSULATION RESISTANCE TEST

1. Unplug the power cord and short the two prongs of the plug with a jumper wire.
2. Turn on the power switch.
3. Measure the resistance value with an ohmmeter between the jumpered AC plug and each exposed metal cabinet part (screwheads, control shafts, bottom frame, etc.).  
Note: Some exposed parts may be isolated from the chassis by design. These will read infinity.
4. If the measurement is outside the specified limits, there is a possibility of a shock hazard.  
The equipment should be repaired and rechecked before it is returned to the customer.



## FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.

When repairing, the following precautions will help prevent recurring malfunctions.

- 1) Cover the plastic part's boxes with aluminum foil.
- 2) Ground the soldering irons.
- 3) Use a conductive mat on the worktable.
- 4) Do not touch the IC or LSI pins with bare fingers.

## BATTERY CAUTION

### CAUTION

Danger of explosion if battery is incorrectly replaced.

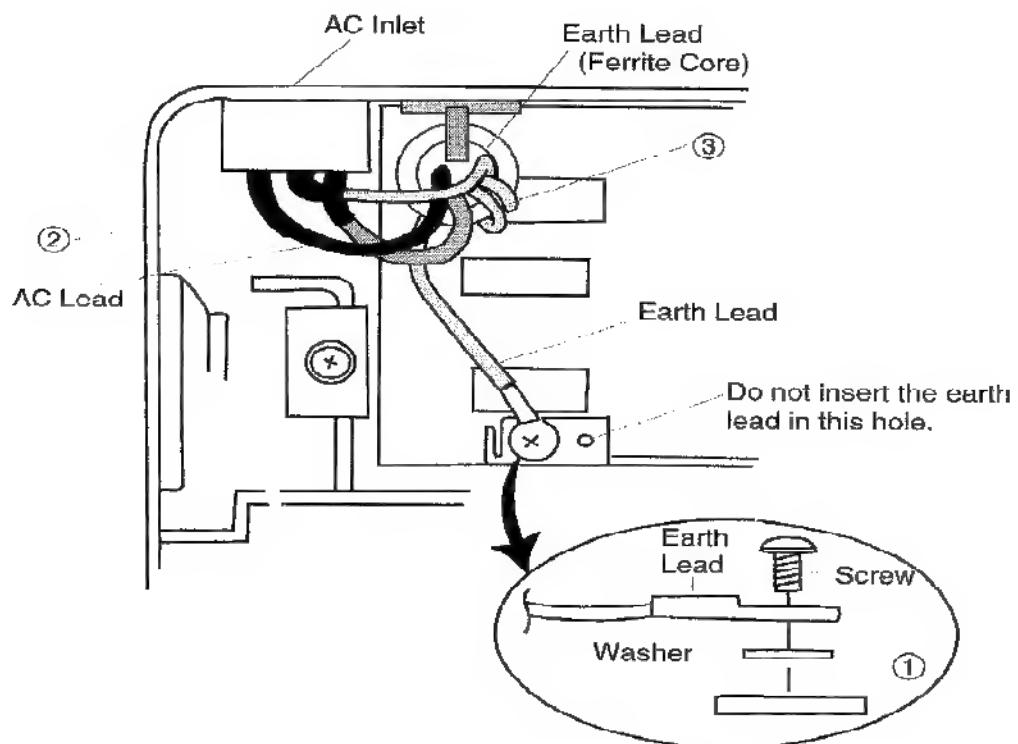
Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

## AC CAUTION

For safety, before closing the lower cabinet, please make sure of the following precautions.

- ① The earth lead is fixed with the screw.
- ② The AC connector is connected properly.
- ③ Wrap the Earth lead around the core 2 times.

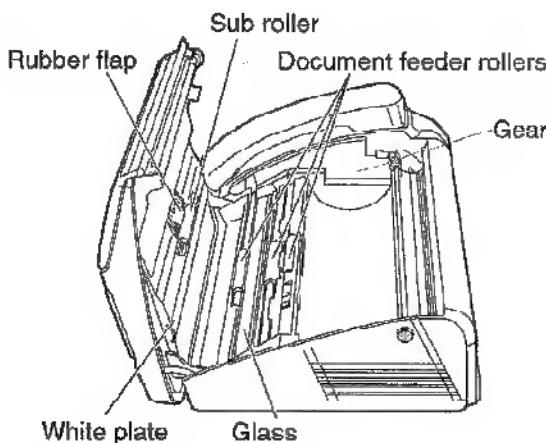
(BOTTOM VIEW)



# PERSONAL SAFETY PRECAUTIONS

## 1. MOVING SECTIONS OF THE UNIT

Be careful not to let your hair, clothes, fingers, accessories, etc., become caught in any moving sections of the unit. The moving sections of the unit are the rollers and a gear. There is a separation roller and a document feed roller which are rotated by the document feed motor. A gear rotates the two rollers. Be careful not to touch them with your hands, especially when the unit is operating.



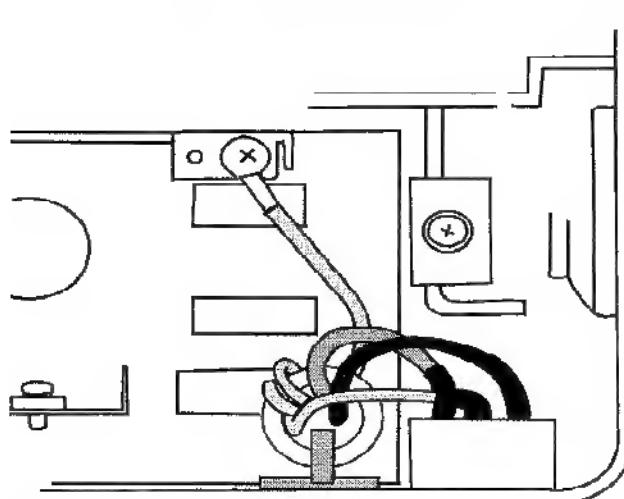
## 2. LIVE ELECTRICAL SECTIONS

All the electrical sections of the unit supplied with AC power by the AC power cord are live. Never disassemble the unit for service with the AC power supply plugged in.



AC voltage is supplied to the primary side of the power supply unit. Therefore, always unplug the AC power cord before disassembling for service.

**Be careful of "High Voltage" in this area.**



(Bottom view)

## SPECIFICATIONS

<b>Applicable Lines:</b>	Public Switched Telephone Network
<b>Document Size:</b>	Max. 216 mm (8 1/2") in width Max. 600 mm (23 5/8") in length 208 mm (8 1/8")
<b>Effective Scanning Width:</b>	216×30 m (8 1/2"×98")
<b>Recording Paper Size:</b>	208 mm (8 1/8")
<b>Effective Printing Width:</b>	Approx. 15 sec./page (Original mode) Approx. 30 sec./page (G3 Normal mode)
<b>Transmission Time*:</b>	Horizontal: 8 pels/mm (203 pels/inch) Vertical: 3.85 lines/mm (98 lines/inch)—Standard mode 7.7 lines/mm (196 lines/inch)—Fine/Halftone mode 15.4 lines/mm (392 lines/inch)—Super Fine mode
<b>Scanning Density:</b>	64-level
<b>Halftone Level:</b>	Contact Image Sensor
<b>Scanner Type:</b>	Thermal Printing
<b>Printer Type:</b>	Modified Huffman (MH), Modified READ (MR)
<b>Data Compression System:</b>	9,600/7,200/4,800/2,400 bps; Automatic Fallback
<b>Modem Speed:</b>	5~35°C (41~95°F), 45~85% RH (Relative Humidity)
<b>Operating Environment:</b>	135×323×229 mm (5 1/8"×12 5/8"×9")
<b>Dimensions (H×W×D):</b>	Approx. 2.9 kg (6.4 lb.)
<b>Mass (Weight):</b>	Transmission: Approx. 20 W / Reception: Approx. 40 W Copy: Approx. 40 W / Standby: Approx. 7.5 W
<b>Power Consumption:</b>	Maximum: Approx. 125 W (When using a 100% black document copy) 220~240 V AC, 50/60 Hz
<b>Power Supply:</b>	Approx. 13 minutes of recording time including the greeting message when no fax documents are in memory.** OR
<b>Memory capacity:</b>	Approx. 13 pages of document memory based on ITU-T Test Chart No.1 in standard resolution when no voice messages have been recorded.***

Transmission speed depends upon the contents of the pages, resolution, telephone line conditions and capability of the receiving unit.

The 15 second speed is based upon ITU-T Test Chart No.1. (Refer to the next page.)

\*\* Recording time may be reduced by the caller party's background noise.

\*\*\* If both fax documents and voice messages are recorded in memory, the corresponding capacities above will be shortened.

**Note:**

- Any details given in these instructions are subject to change without notice.
- The pictures and illustrations in these instructions may vary slightly from actual product.

## OPTIONAL ACCESSORIES

Parts No.	Description	Comment
KX-A106	Standard thermal recording paper	216 mm × 30 m (8 1/2"×98') roll, with 25 mm (1") core
KX-A125	Super thermal recording paper (Like plain paper)	216 mm × 30 m (8 1/2"×98') roll, with 25 mm (1") core

## ITU-T TEST CHART NO.1 (Actual size)



## THE SLEREXE COMPANY LIMITED

SAPORS LANE - BOOLE - DORSET - BH 2S 8 ER

TELEPHONE BOOLE (945 13) 51617 - TELEX 123456

INTRODUCTION

Our Ref. 350/PJC/EAC

18th January, 1972.

Dr. P.N. Gundall,  
 Mining Surveys Ltd.,  
 Holroyd Road,  
 Reading,  
 Berks.

Dear Pete,

Permit me to introduce you to the facility of facsimile transmission.

In facsimile a photocell is caused to perform a raster scan over the subject copy. The variations of print density on the document cause the photocell to generate an analogous electrical video signal. This signal is used to modulate a carrier, which is transmitted to a remote destination over a radio or cable communications link.

At the remote terminal, demodulation reconstructs the video signal, which is used to modulate the density of print produced by a printing device. This device is scanning in a raster scan synchronised with that at the transmitting terminal. As a result, a facsimile copy of the subject document is produced.

Probably you have uses for this facility in your organisation.

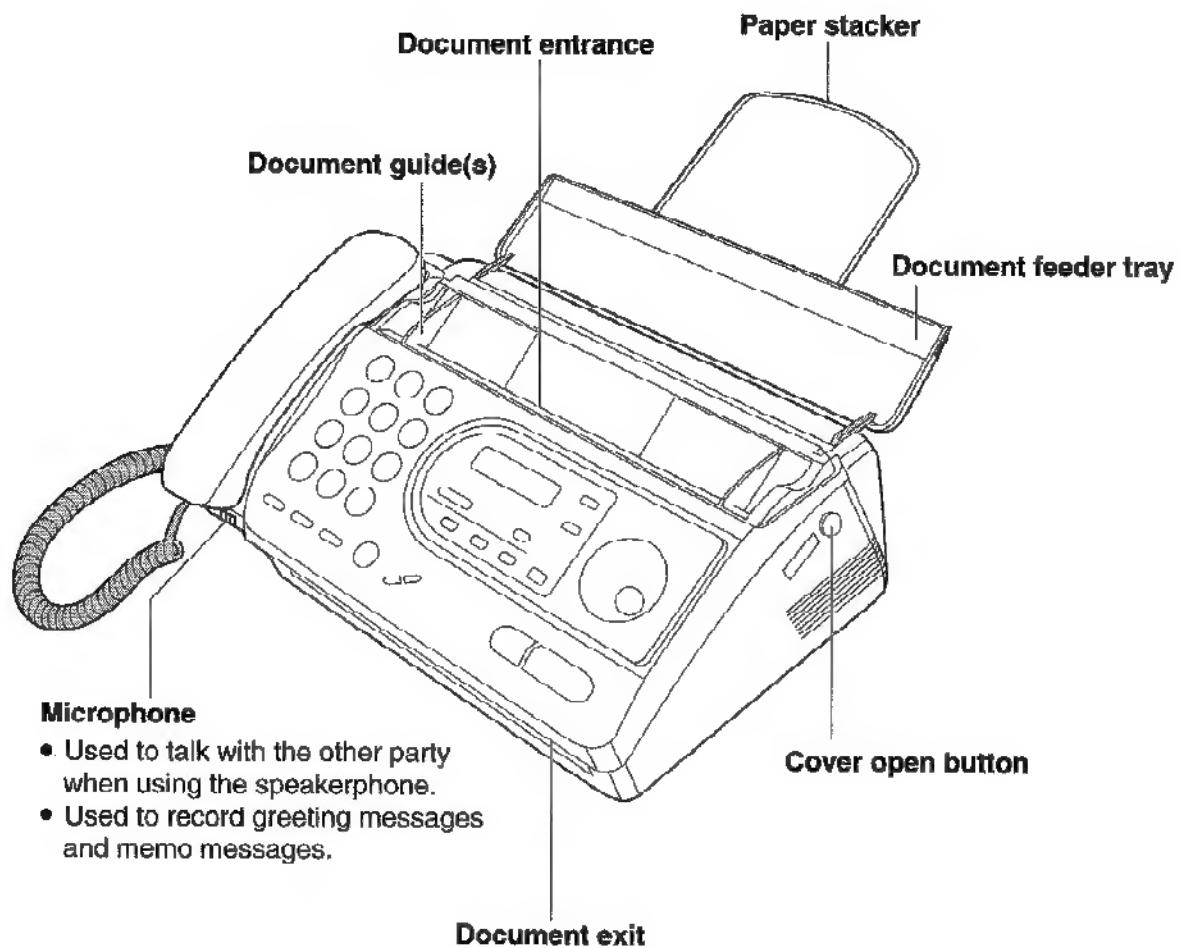
Yours sincerely,

*Phil.*

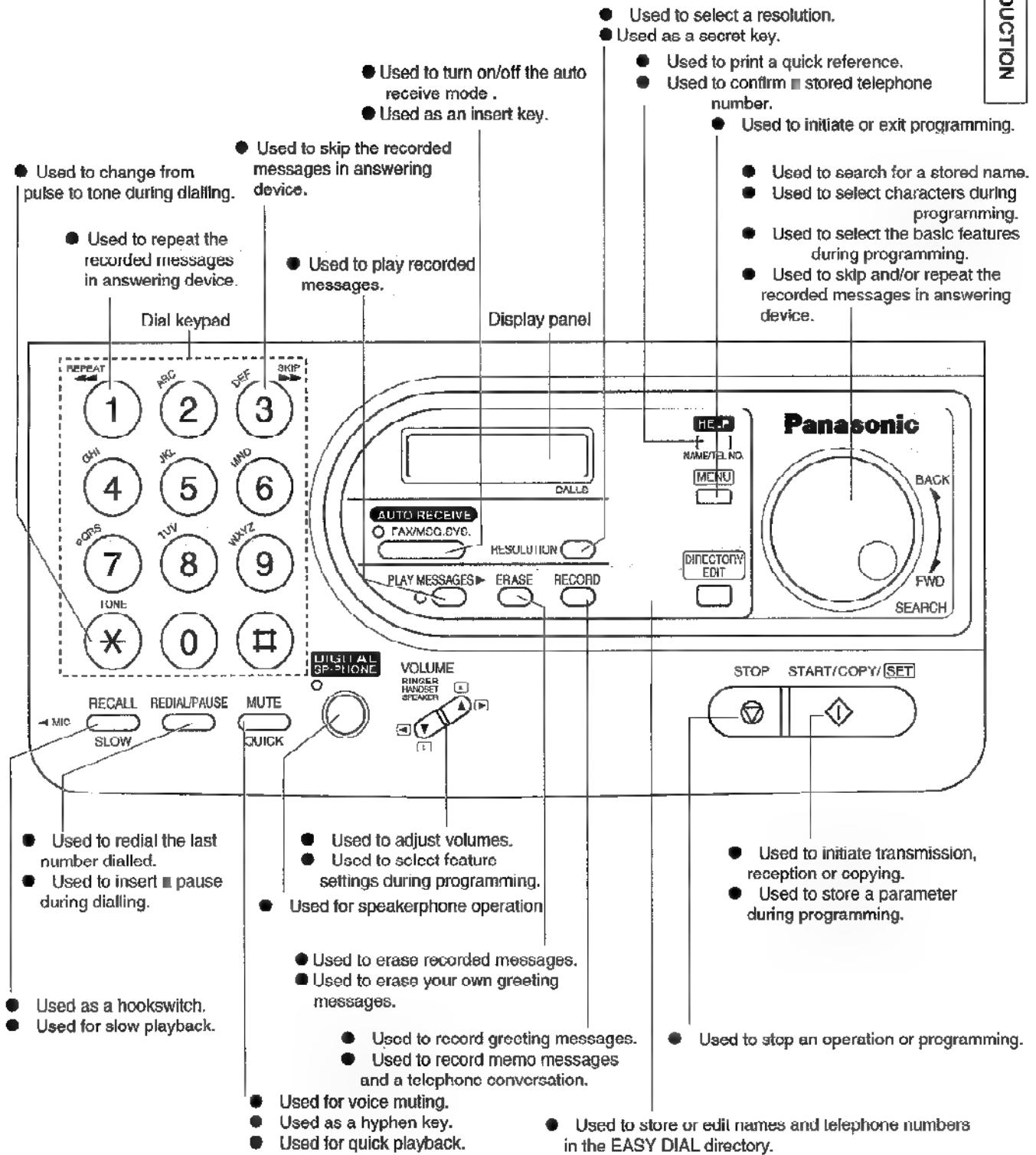
P.J. CROSS  
 Group Leader - Facsimile Research

## **LOCATION OF CONTROLS**

### **1.OVERVIEW**



## 2. CONTROL PANEL



## FEATURES

### **General**

- Desktop type
- LCD (Liquid Crystal Display) readout
- Help function
- Copier function
- Auto cutter
- Digital answering system
- Digital duplex speaker phone

### **Facsimile**

- Space Saving Compact Design
- Resolution: standard/fine/super fine/halftone
- Copier Function
- Automatic Document Feeder (10 Sheets)
- Help Printout
- Easy-to-view LCD (15 Characters)
- Super Thermal Paper
- FAX Pager Alert
- Out of paper reception (13 pages\*1)

\*1 Actual number of the pages depends upon recording time, the contents of the documents and resolution. 13-page capacity is based upon ITU-T TEST CHART No. 1 at standard resolution on the condition that the recording time is zero.

### **Integrated telephone system**

- Easy Dial Operation
- Telephone Directory (100 Stations)
- Electric Volume Control
- Digital duplex speaker phone

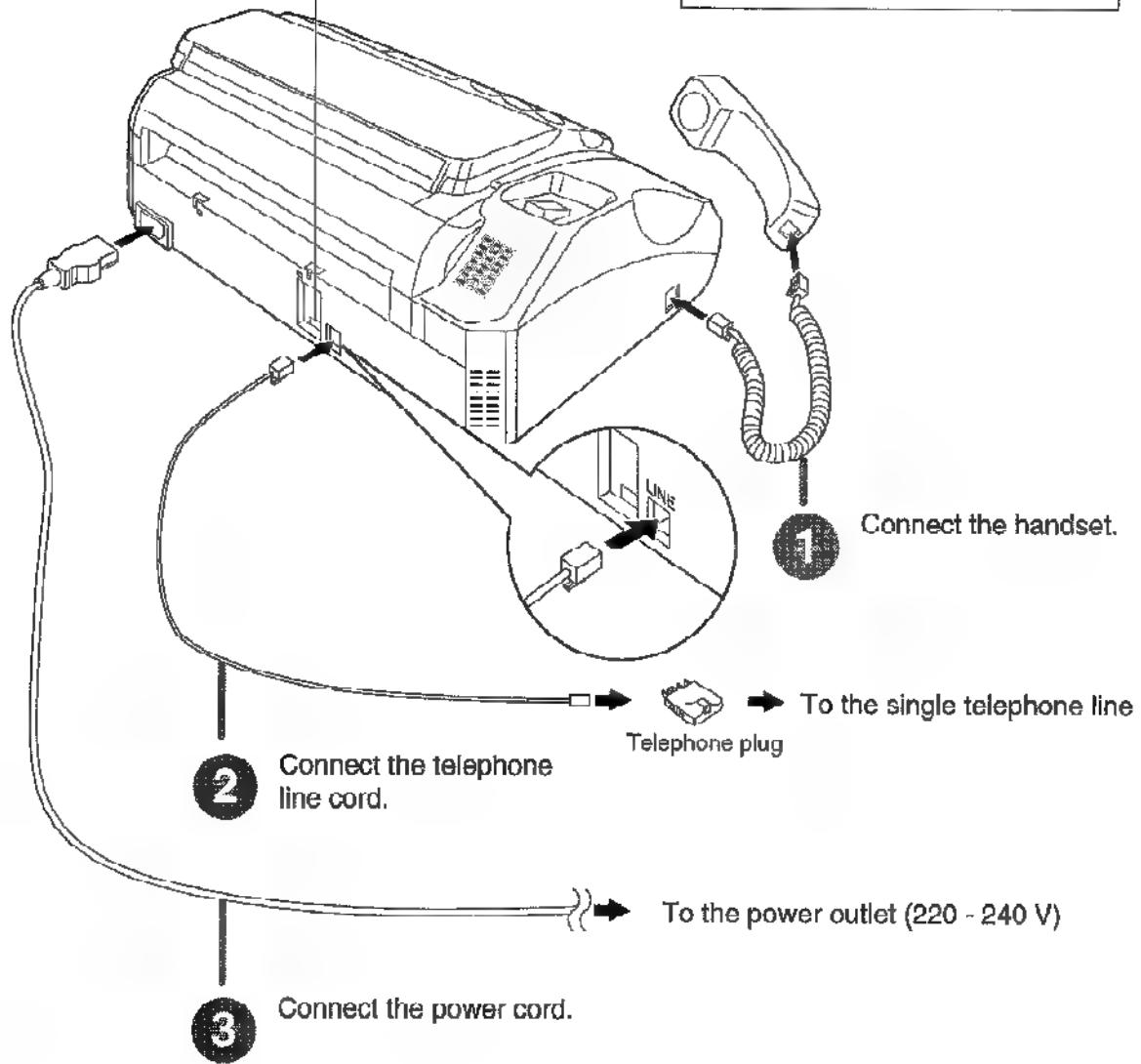
### **Digital answering system**

- Voice time/Day stamp
- 20-minute recording time\*2
- Voice guidance

\*2 Recording time depends upon the FAX's reception memory capacity because this system shares memory with the FAX unit.

## CONNECTIONS

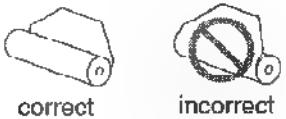
**Dialling mode switch:** DIALING MODE  
Set to TONE.  
1 If you cannot dial,  
set to PULSE



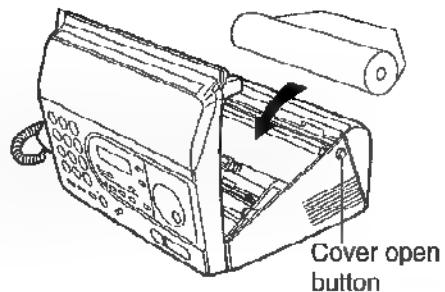
## INSTALLATION

### 3. INSTALLING THE RECORDING PAPER

**1** Open the cover by pressing the cover open button and install the recording paper roll.

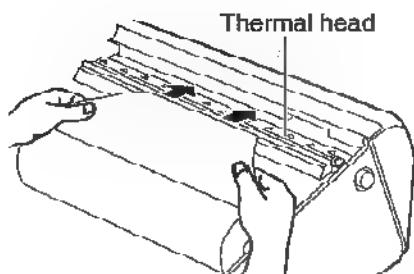


- If the paper is secured with glue or tape, cut approximately 15 cm (6 inches) from the beginning of the roll.

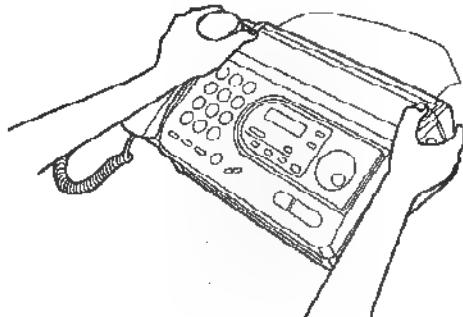


**2** Insert the leading edge of the paper into the opening above the thermal head and pull it out of the unit.

- Make sure that there is no slack in the paper roll.



**3** Close the cover securely by pushing down on both corners.

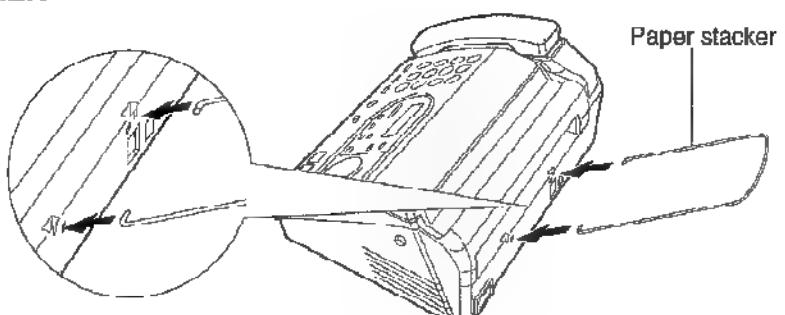


**Note:**

- Only use the included roll of paper or specified recording paper, or else the print quality may be affected and/or excessive thermal head wear may occur.
- To order recording paper, see page 8.
- When the power cord is connected, everytime you close the cover a message will be printed. If the recording paper is set to the wrong side, a message will not be printed. Install the paper correctly.

### 4. INSTALLING THE PAPER STACKER

Install the paper stacker into the slots as shown.



## 5. SETTING YOUR LOGO

The logo can be a company, division or personal name.

(1) Press **MENU**.

Display: 1. SYSTEM SET UP

(2) Press **#**, then **① ②**.

YOUR LOGO

(3) Press **START/COPY/SET**.

LOGO=

(4) Enter your logo, up to 30 characters, by following the instructions on the next page.

**Example** (using the dial keypad): Bill

1. Press **②** twice.

LOGO=B

2. Press **④** six times.

LOGO=Bi

3. Press **⑤** six times.

LOGO=Bi\_

4. Press **▶** (**VOLUME**) to remove the cursor and press **⑤** six times.

LOGO=Bill

- To enter the same number key continuously, move the cursor to the next space.

(5) Press **START/COPY/SET**.

SYSTEM SET UP [ ]

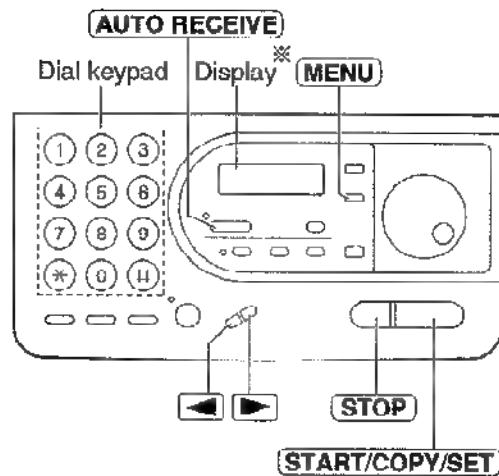
(6) Press **MENU**.

### To correct a mistake

- Use **◀** or **▶** to move the cursor to the incorrect character, then make the corrections.

### To delete a character

- Move the cursor to the character you want to delete and press **STOP**.



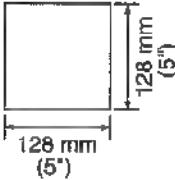
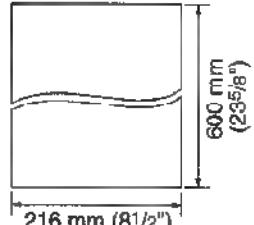
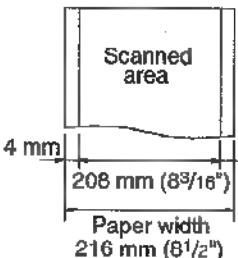
## KX-FT37AL

### Selecting characters with the dial keypad

Pressing the dial keys will select a character as shown below.

Keys	Characters
(1)	I [ ] { } + - / = - ; : ? !
(2)	A B C a b c 2
(3)	D E F d e f 3
(4)	G H I g h i 4
(5)	J K L J K L 5
(6)	M N O m n o 6
(7)	P Q R S p q r s 7
(8)	T U V t u v 8
(9)	W X Y Z w x y z 9
0	0 ( ) < > ! " # \$ % & * @ ^ ' →
AUTO RECEIVE	Insert key (Used to insert a space.)
METE	Hyphen key (Used to insert a hyphen in the telephone number.)
RESOLUTION	Secret key (Used to keep the telephone number secret.)
VOLUME ▼	◀ key (Used to move the cursor to the left.)
VOLUME ▲	▶ key (Used to move the cursor to the right.) To enter the same number key continuously, move the cursor to the next space.

### Documents you can send

Minimum size	Maximum size	Effective scanning area	Document weight
			<p>Single sheet: 45 to 90 g/m<sup>2</sup> (12 to 24 lb.)</p> <p>Multiple sheets: 60 to 75 g/m<sup>2</sup> (16 to 20 lb.)</p>

#### Note:

- Remove clips, staples or other similar fastening objects.
- Check that ink, paste or correction fluid has dried.
- Do not send the following types of documents. Use copies for fax transmission.
  - Chemically treated paper such as carbon or carbonless duplicating paper
  - Electrostatically charged paper
  - Heavily curled, creased or torn paper
  - Paper with a coated surface
  - Paper with a faint image
  - Paper with printing on the opposite side that can be seen through the front (e.g. newspaper)

# MAINTENANCE ITEMS AND COMPONENT LOCATIONS

## 1. OUTLINE

MAINTENANCE AND REPAIRS ARE PERFORMED USING THE FOLLOWING STEPS.

### 1) Periodic maintenance

Inspect the equipment periodically and if necessary, clean any contaminated parts.

### 2) Check for breakdowns

Look for problems and consider how they arose.

If the equipment can be still used, perform copying, self testing or communication testing.

### 3) Check equipment

Perform copying, self testing and communication testing to determine if the problem originates from the transmitter, receiver or the telephone line.

### 4) Determine causes

Determine the causes of equipment problem by troubleshooting.

### 5) Equipment repairs

Repair or replace the defective parts and take appropriate measures at this stage to ensure that the problem will not recur.

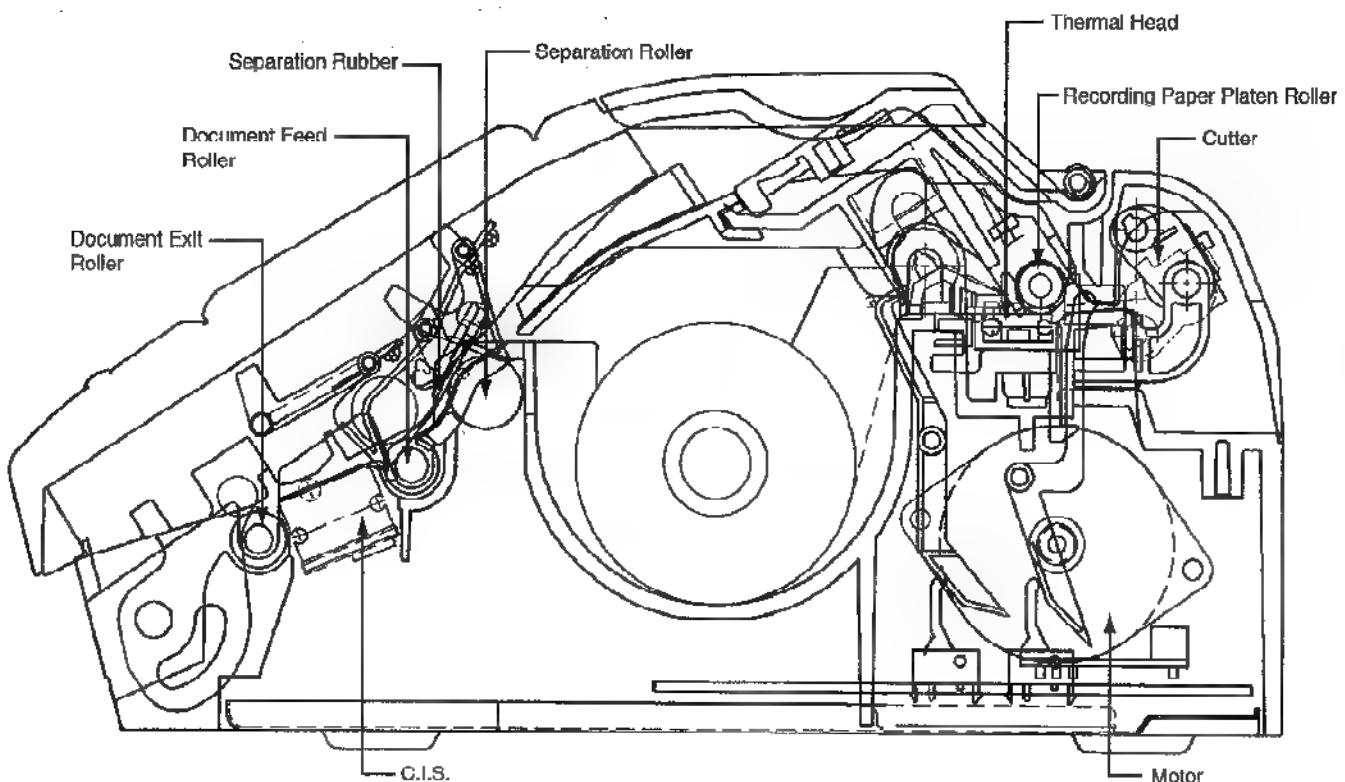
### 6) Confirm normal operation of the equipment

After completing the repairs, conduct copying, self testing and communication testing to confirm that the equipment operates normally.

### 7) Record keeping

Make a record of the measures taken to rectify the problem for future reference.

## 2. MAINTENANCE CHECK ITEMS/COMPONENT LOCATIONS



## KX-FT37AL

### 2.1 MAINTENANCE LIST

NO.	OPERATION	CHECK	REMARKS
1	Document Path	Remove any foreign matter such as paper.	_____
2	Rollers	If the roller is dirty, clean it with a damp cloth then dry thoroughly.	See page 19.
3	Thermal Head	If the thermal head is dirty, clean the printing surface with a cloth moistened with denatured alcohol (alcohol without water), then dry thoroughly.	See pages 20 and 101.
4	Glass	If the glass is dirty, clean the glass with a dry soft cloth.	See page 19.
5	Sensors	Document sensor (PS1), Read position sensor (PS2), cover open sensor (PS3), JAM sensor(SW4)	See page 79.
■	Abnormal, wear and tear or loose parts	Exchange the part. Check If the screws are tight on all parts.	_____

### 2.2 MAINTENANCE CYCLE

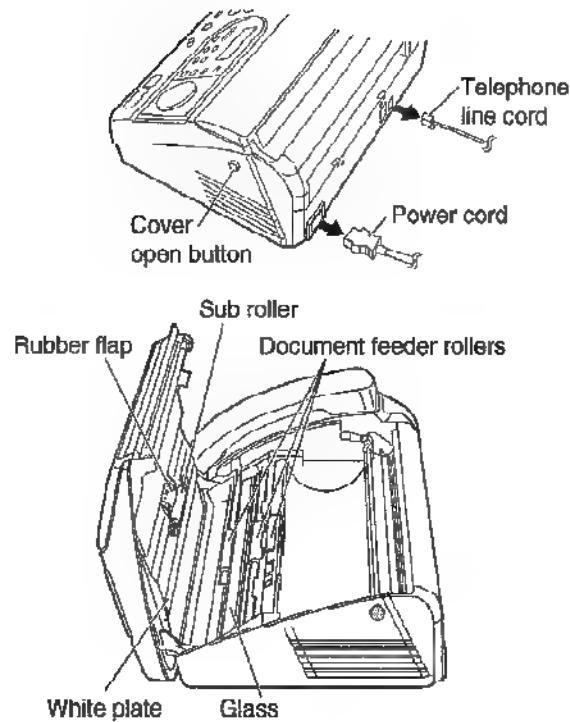
No.	Item	Cleaning		Replacement	
		Cycle	Procedure	Cycle	Procedure
1	Separation Roller (Ref. No. 89)	3 months	See p. 19.	7 years (100,000 documents)	See p. 100.
■	Separation Rubber (Ref. No. 35)	3 months	See p. 19.	7 years (100,000 documents)	See p. 96.
3	Feed Rollers (Ref. No. 65)	3 months	See p. 19.	7 years (100,000 documents)	See p. 100.
4	Thermal Head (Ref. No. 55)	3 months	See p. 20.	7 years (100,000 documents)	See p. 101.

These values are only standard ones and may vary depending on usage conditions.

### 3. MAINTENANCE

#### 3.1 CLEANING THE DOCUMENT FEEDER UNIT

- 1** Disconnect the power cord and telephone line cord.
- 2** Open the cover by pressing the cover open button.
- 3** Clean the document feeder rollers, sub roller and rubber flap with a cloth moistened with isopropyl rubbing alcohol, and let all parts dry thoroughly.
- 4** Clean the white plate and glass with a soft dry cloth.
- 5** Close the cover securely by pushing down on both corners.
- 6** Connect the power cord and the telephone line cord.



**Caution:**

- Do not use paper products, such as paper towels or tissues, to clean the inside of the unit.

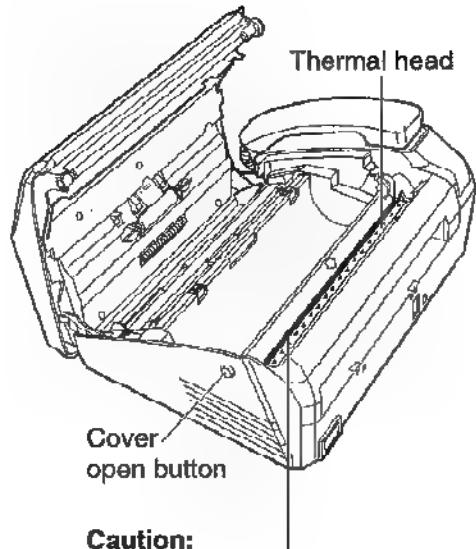
## KX-FT37AL

### 3.2 CLEANING THE THERMAL HEAD

- 1** Disconnect the power cord and telephone line cord.
- 2** Open the cover by pressing the cover open button.
- 3** Clean the thermal head with a cloth moistened with isopropyl rubbing alcohol, and let it dry thoroughly.
- 4** Close the cover securely by pushing down on both corners.
- 5** Connect the power cord and the telephone line cord.

**Caution:**

- To prevent a malfunction due to static electricity, do not use a dry cloth and do not touch the thermal head directly with your fingers.



**Caution:**

- Do not push on the black cover.

### 3.3 CLEANING THE PLATEN ROLLER .....Refer to page 96.

# TROUBLESHOOTING GUIDE

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## **1. TROUBLESHOOTING SUMMARY**

### **1-1. TROUBLESHOOTING**

After confirming the problem by asking the user, troubleshoot according to the instructions and observe the following precautions.

### **1-2. PRECAUTIONS**

- 1) If there is trouble with the print quality or the paper feed, first check if the installation space and the print paper meets the specifications, the paper selection lever/paper thickness lever is set correctly, and the paper is set correctly without any slack.
- 2) Before troubleshooting, first check that the connectors and cables are connected correctly (not loose). If the problem occurs randomly, check it very carefully.
- 3) When connecting the AC power cord with the unit case and checking the operation, exercise utmost care when handling electric parts in order to avoid electric shock and short-circuits.
- 4) After troubleshooting, double check that you have not forgotten any connectors, left any loose screws, etc.
- 5) Always test to verify that the unit is working normally.

## 2. USER RECOVERABLE ERRORS

If the unit detects a problem, the following messages will appear on the display.

DISPLAY MESSAGE	CAUSE AND REMEDY
CALL SERVICE	<ul style="list-style-type: none"> <li>There is something wrong with the unit. [Check the thermistor on the thermal head and connector lead.(for technicians)] [This error is displayed when the thermal head does not warm up.]</li> </ul>
CHECK COVER	<ul style="list-style-type: none"> <li>The cover is open. Close it.</li> </ul>
CHECK DOCUMENT	<ul style="list-style-type: none"> <li>The document is not fed into the unit properly. Reinsert the document. If misfeeding occurs frequently, clean the document feeder rollers inside the unit. If the problem remains, adjust the feeder pressure.</li> <li>Attempted to transmit a document longer than 600 mm (23 5/8"). Press the STOP button and remove the document. Divide the document into two or more sheets and try again. [If you do wish to divide the document, change the service code #559 to "OFF". Refer to page 87.]</li> </ul>
CHECK MEMORY	<ul style="list-style-type: none"> <li>Memory (phone numbers, parameters, etc.) has been erased. Re-program.</li> </ul>
DIRECTORY FULL	<ul style="list-style-type: none"> <li>There is no space to store new stations in the EASY DIAL directory. Edit or erase unnecessary stations.</li> </ul>
FAX IN MEMORY	<ul style="list-style-type: none"> <li>The unit has (a) document(s) in memory. See the other message instructions to print out the document(s).</li> </ul>
MEMORY FULL	<ul style="list-style-type: none"> <li>There is no room left in memory to record a message. Erase some or all of the messages.</li> <li>The memory is full of received documents. Install a new recording paper roll, or clear the jammed paper.</li> </ul>
NO RESPONSE	<ul style="list-style-type: none"> <li>The receiving unit is busy or out of recording paper. Try again.</li> </ul>
OUT OF PAPER	<ul style="list-style-type: none"> <li>The unit ran out of recording paper. Install a new recording paper roll.</li> </ul>
PAPER JAMMED	<ul style="list-style-type: none"> <li>The recording paper is jammed. Clear the jammed paper.</li> </ul>
POLLING ERROR	<ul style="list-style-type: none"> <li>The other party's machine does not have a polling feature. Check with the other party.</li> </ul>
REDIAL TIME OUT	<ul style="list-style-type: none"> <li>The other party's machine is busy or out of recording paper. Try again.</li> </ul>
REMOVE DOCUMENT	<ul style="list-style-type: none"> <li>The document is jammed. Remove the jammed document.</li> </ul>
TRANSMIT ERROR	<ul style="list-style-type: none"> <li>A transmission error occurred. Try again.</li> </ul>
UNIT OVERHEATED	<ul style="list-style-type: none"> <li>The unit is too hot. Let the unit cool down. [If many copies are nearly all black, this message will be displayed.] [When this occurs, open the front cover and let the unit cool down.]</li> </ul>

\* The explanations given in the [ ] are for serviceman only.

### 3. TROUBLESHOOTING DETAILS

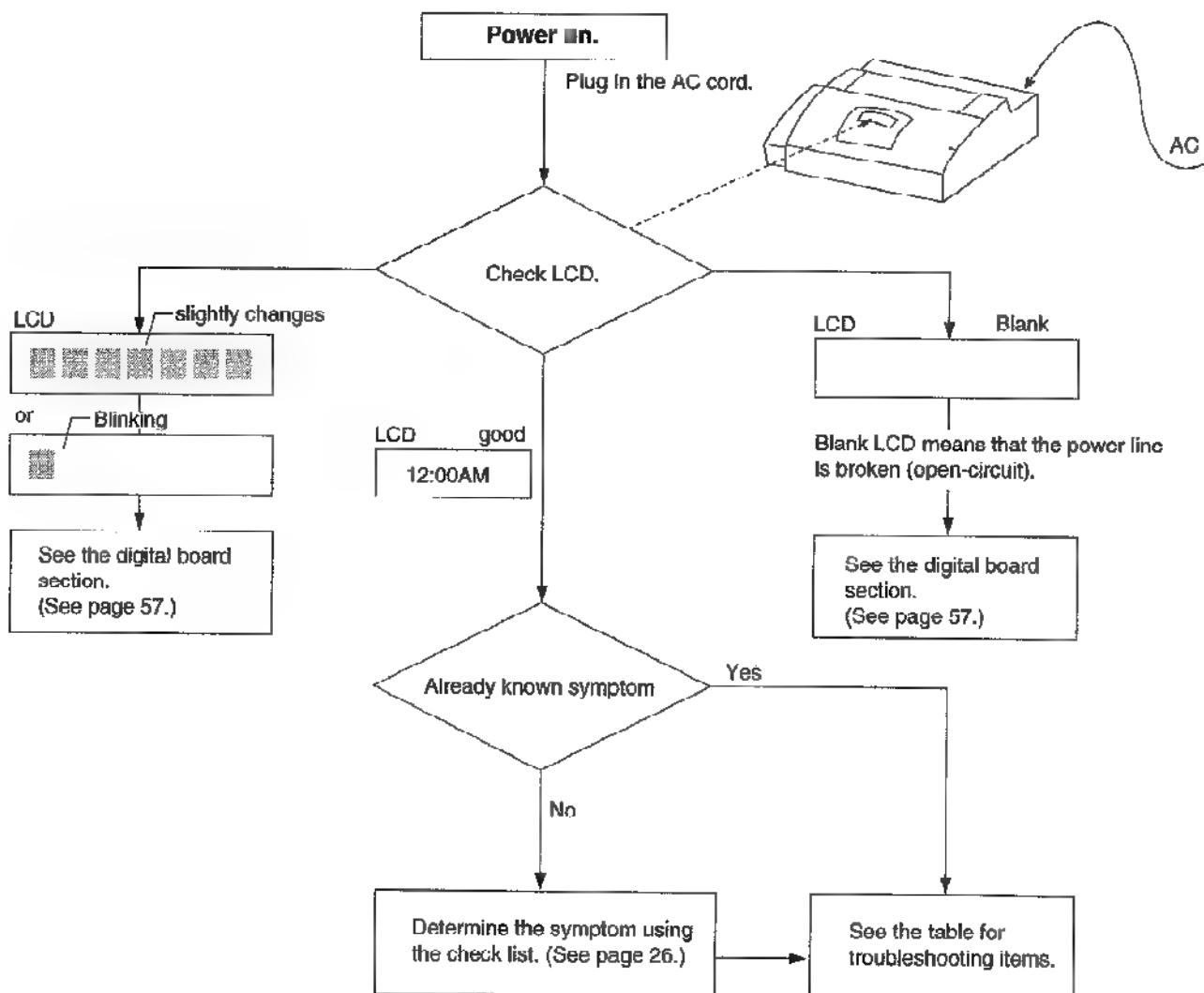
#### 3-1. OUTLINE

The troubleshooting guide provides a logical path of deduction to assist in locating a fault and suggests methods of restoring the unit to full working condition. Use the reported symptoms of the fault to determine the best troubleshooting method. Even difficult faults can be traced to a specific block or area, for example, the "Digital Board" or "Image Sensor".

A variety of fault descriptions from customers often point to the same area and, for this reason, careful analysis of the reported symptoms is required. After every repair, test all functions to ensure no problems are evident.

#### 3-2. STARTING TROUBLESHOOTING

- Select the appropriate troubleshooting method according to the symptoms.



## 3-3. TABLE OF TROUBLESHOOTING ITEMS

FUNCTION	SYMPTOM	SEE THIS PAGE.
Printing	Skewed receiving image Expanded print Image is distorted. Black or White vertical lines appear.	34 34 31 32
ADF (Auto Document Feeder)	No feed Document jam Multiple feed Skew	27 28 29 30
Abnormal mechanical sound	Abnormal sound from the product	34
Cutter	Can't cut the recording paper	33
Power supply	Voltage output is abnormal.	74
Operation panel	Keys are not accepted.	78
Sensor	■ If the electric circuit is the cause, the error message corresponding to the sensor will be displayed.	79
Communication FAX, TEL (Analog/Digital board)	Cannot communicate by fax. Error code is displayed. Cannot talk. DTMF tone doesn't work. Handset/Monitor sound, volume	36 44 } The analog board may cause these symptoms. (Refer to page 69.)

**KX-FT37AL****3-4. SIMPLE CHECK LIST**SERIAL NO.DATE

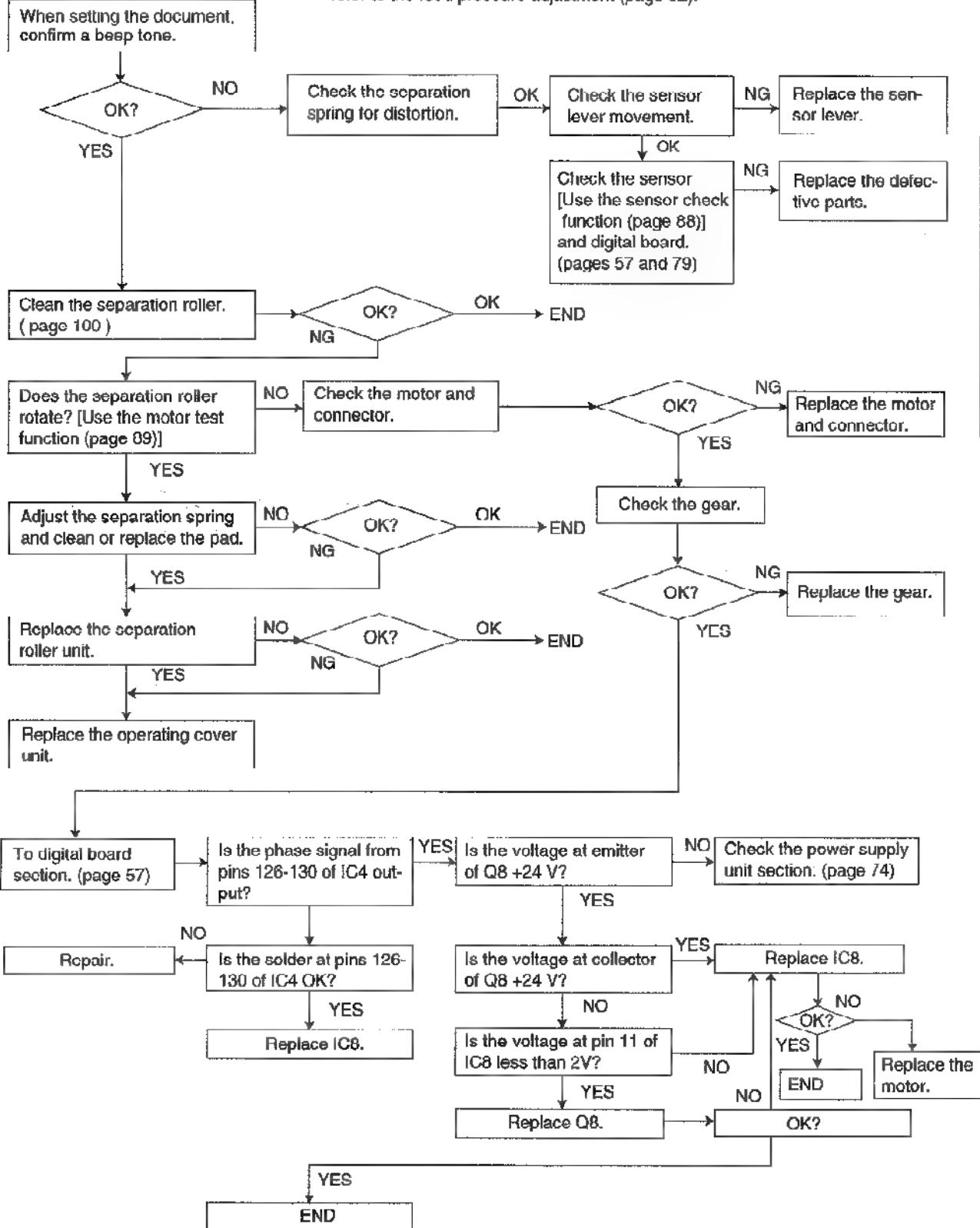
FUNCTION		JUDGEMENT	REFERENCE
FAX operation	Transmission	OK / NG	
	Receiving	OK / NG	
Copy operation	FINE mode	OK / NG	
	HALF TONE mode	OK / NG	
Telephone operation	Handset transceiver/ receiver	OK / NG	
	Ringer sound	OK / NG	
	Dial operation	OK / NG	
	Volume operation	OK / NG	
	VOX detection	OK / NG	Service code 815 * (Digital SP-Phone LED)
Operation panel	Key check	OK / NG	Service code 561 *
	LED check	OK / NG	Service code 557 *
	LCD check	OK / NG	Service code 558 *
Sensor	Sensor check	OK / NG	Service code 815 *
Digital speaker phone		OK / NG	
Digital TAM	Greeting Rec/Play	OK / NG	
	Incoming message Rec/Play	OK / NG	
	Memo Rec/Play	OK / NG	
Voice prompt		OK / NG	Service code 784 Check whether voice prompt is played or not. (See page 88)
Clock		OK / NG	Check accuracy.

\* Check according to the service code referring to the Test function on page 89.

### 3-5. ADF (Auto document feed) SECTION

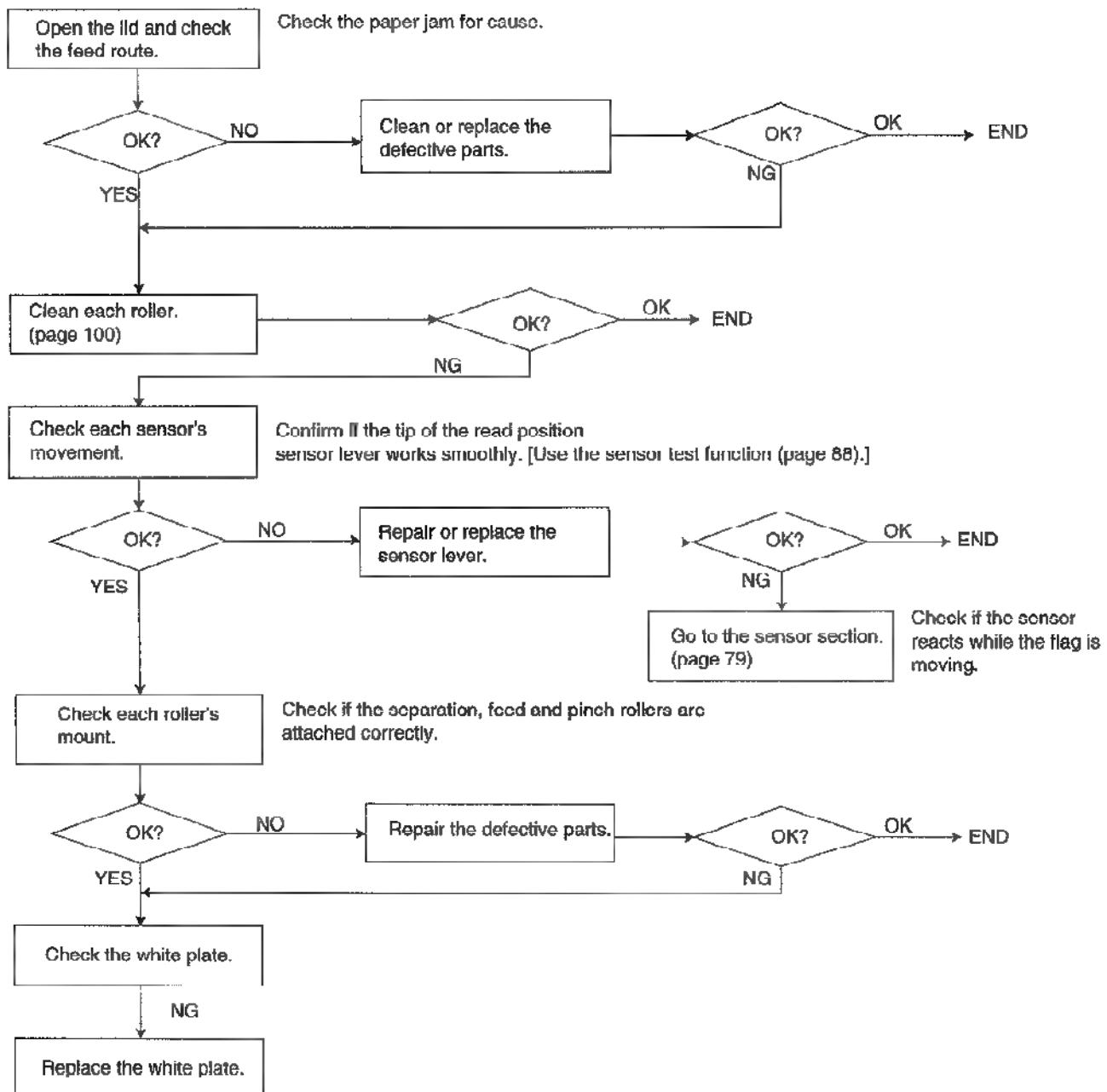
**(1) No document feed**

※ When using thin paper etc., if the document will not feed, refer to the feed pressure adjustment (page 02).



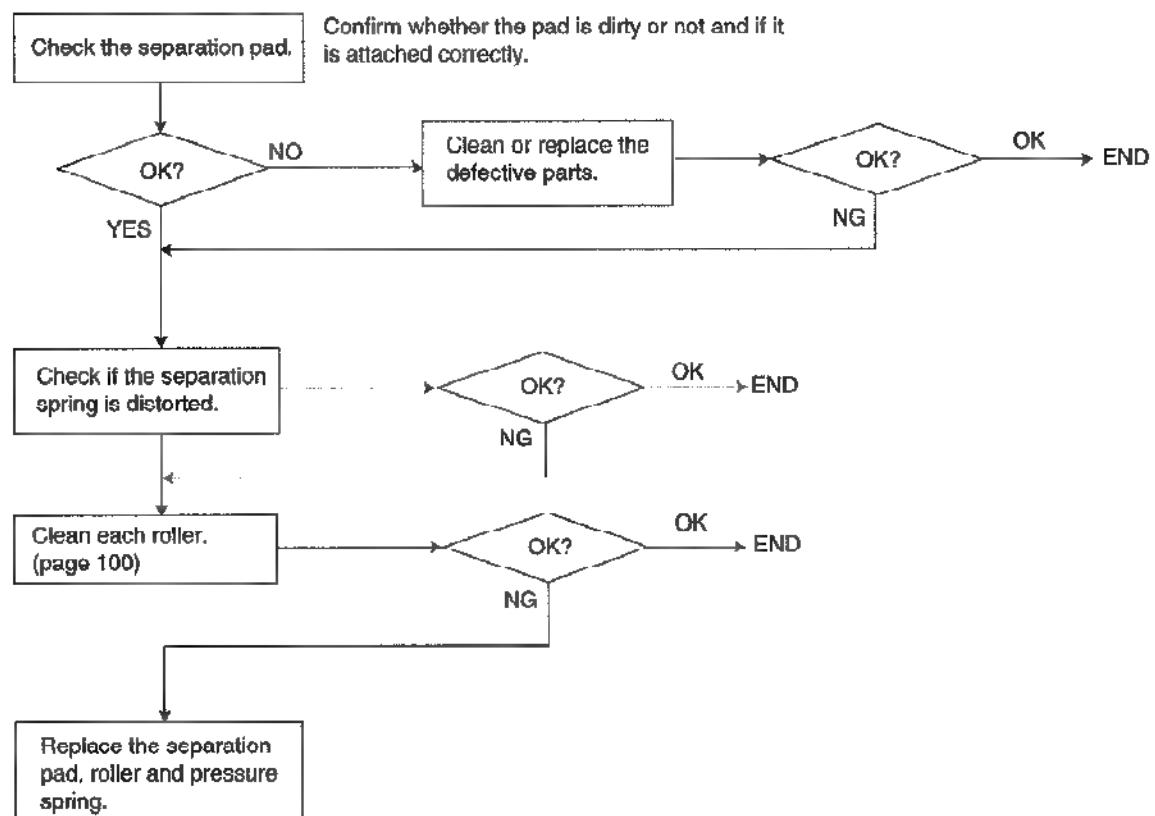
## KX-FT37AL

### (2) Document JAM



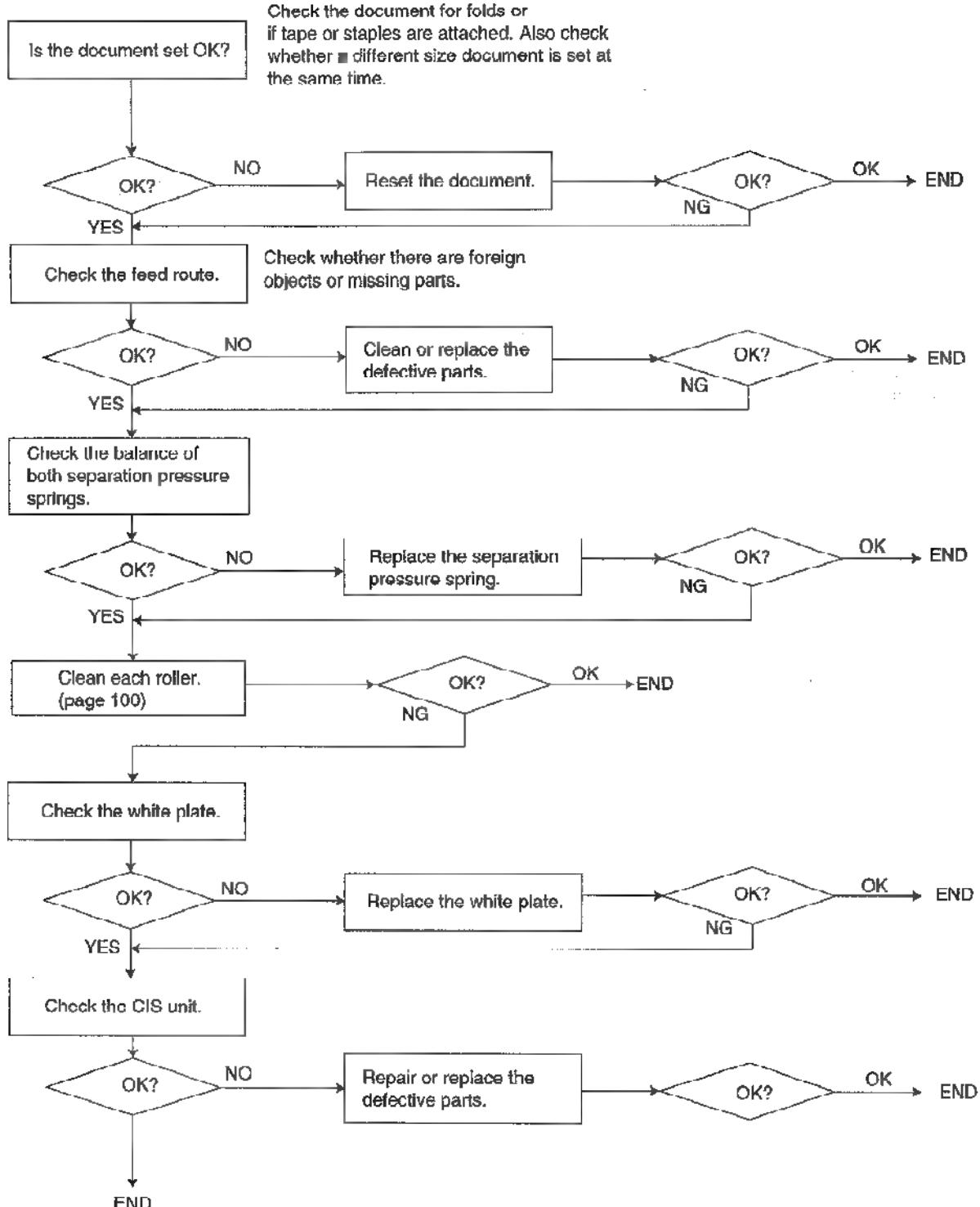
## (3) Multiple feed

- When using thick paper, etc., if the document will not feed, refer to the feed pressure adjustment (page 92).

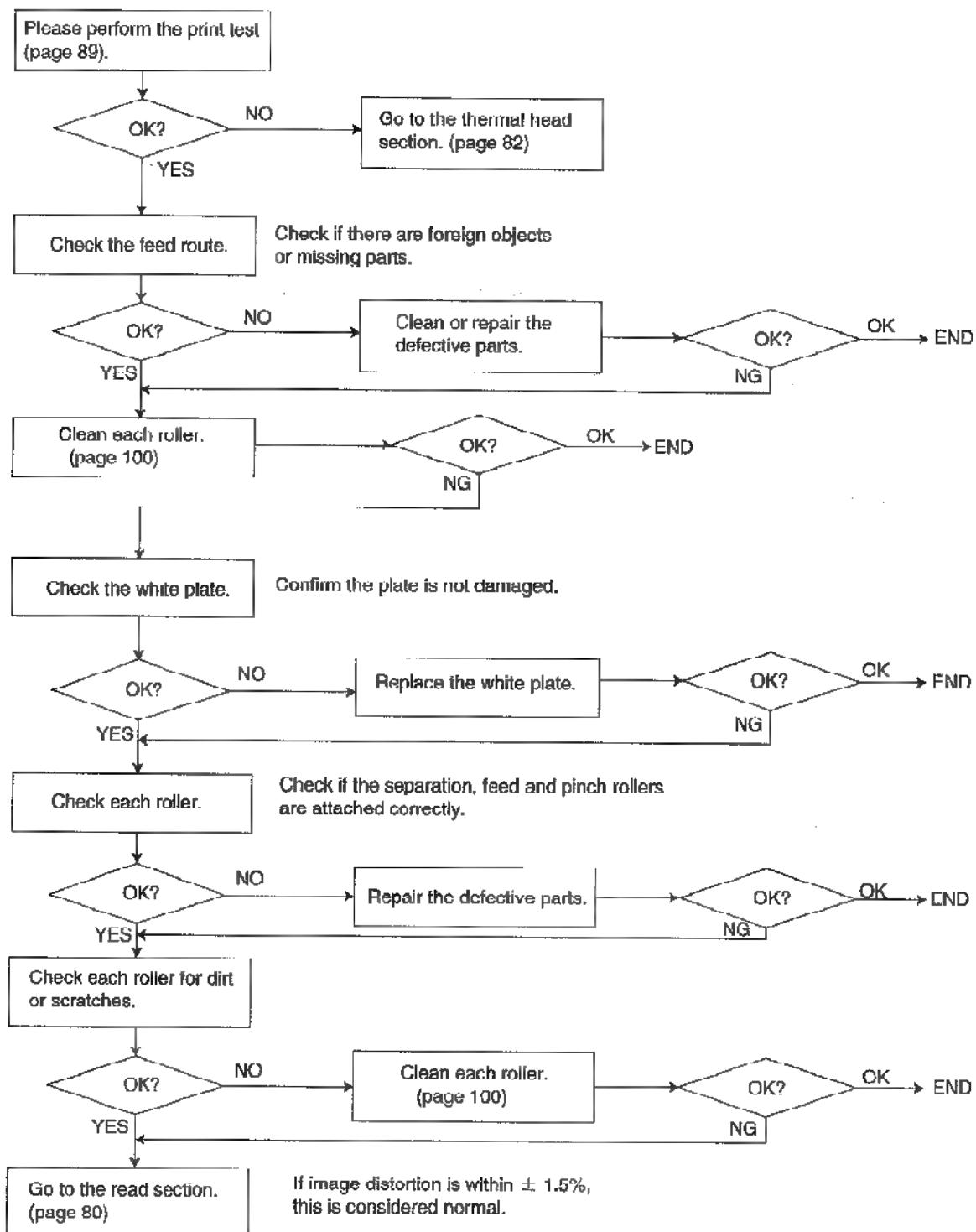


## KX-FT37AL

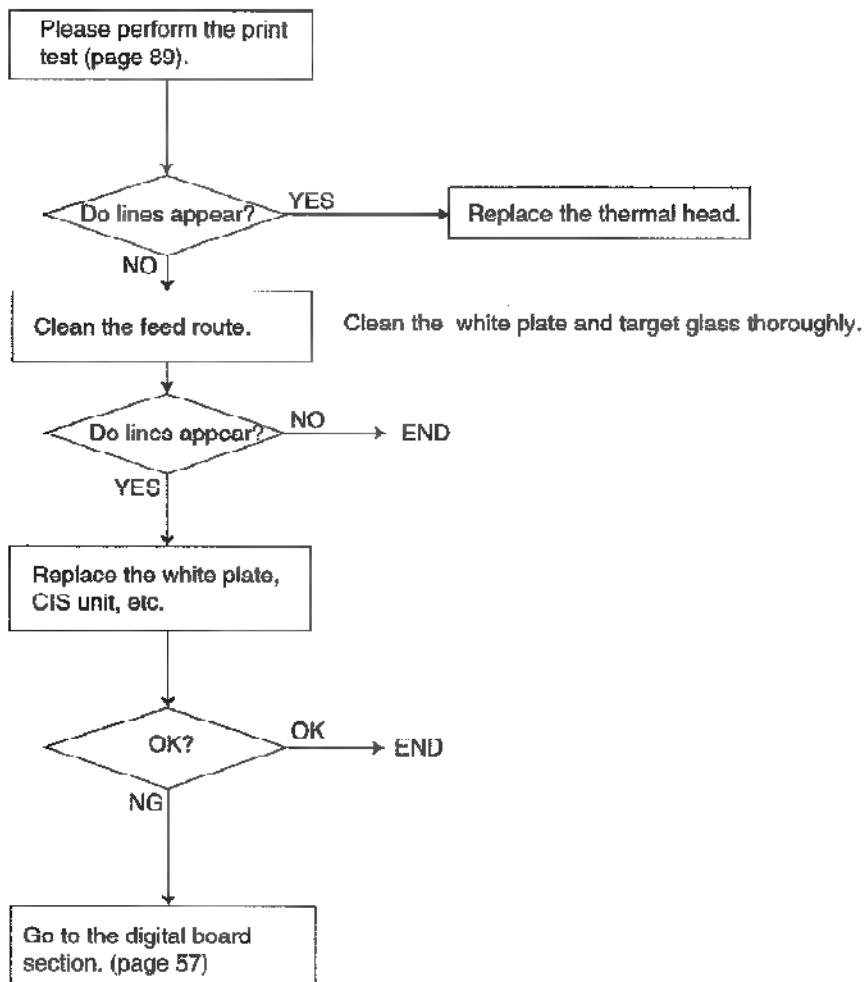
### (4) Skew



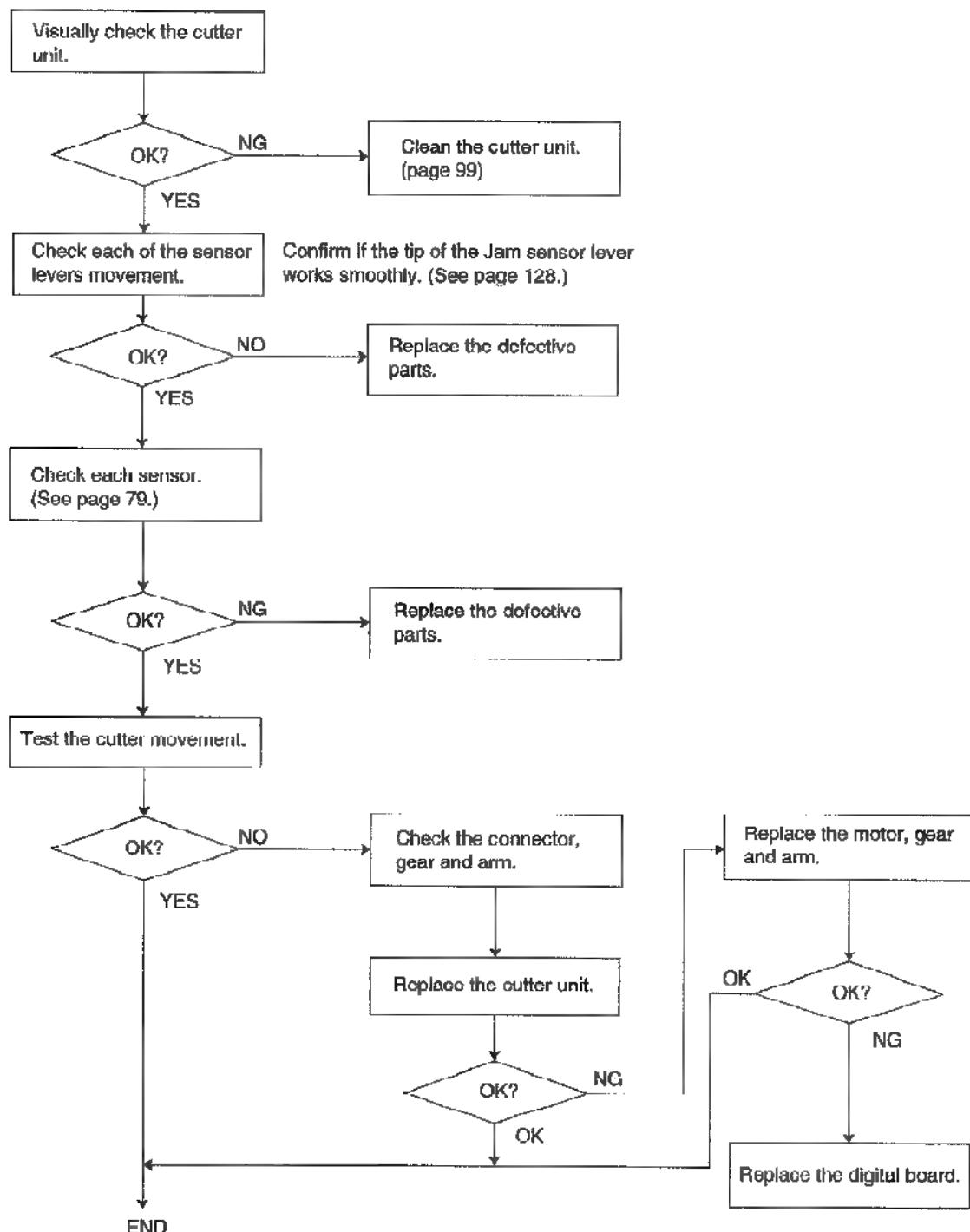
## (5) Image is distorted (When printing)



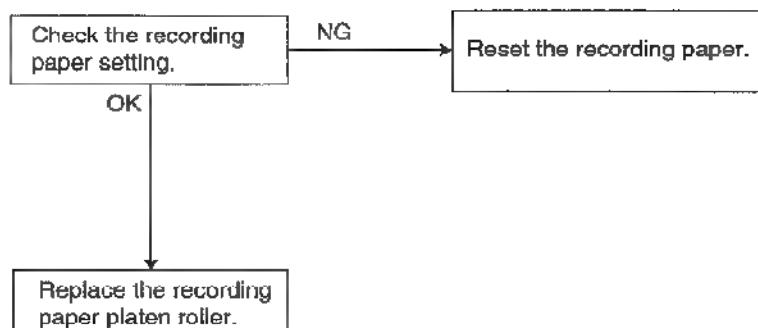
**(6) Black or white vertical lines appear.**



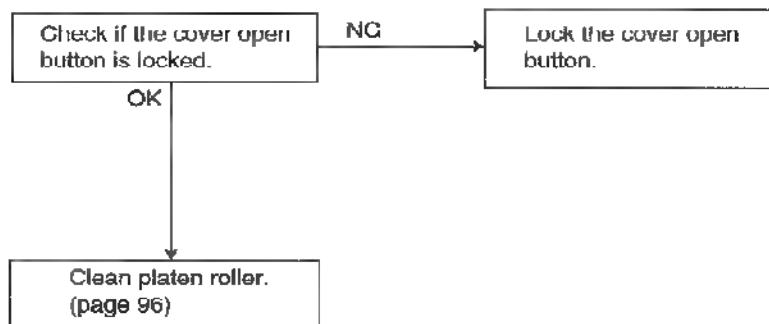
## (7) Can't cut the recording paper.



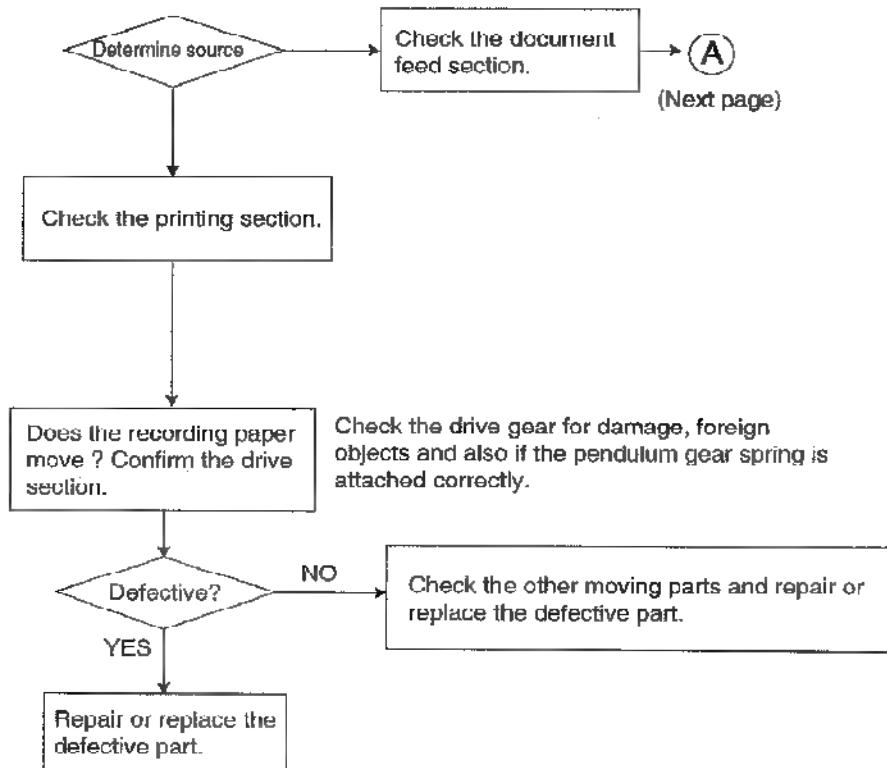
**(8) Skewed receiving image**

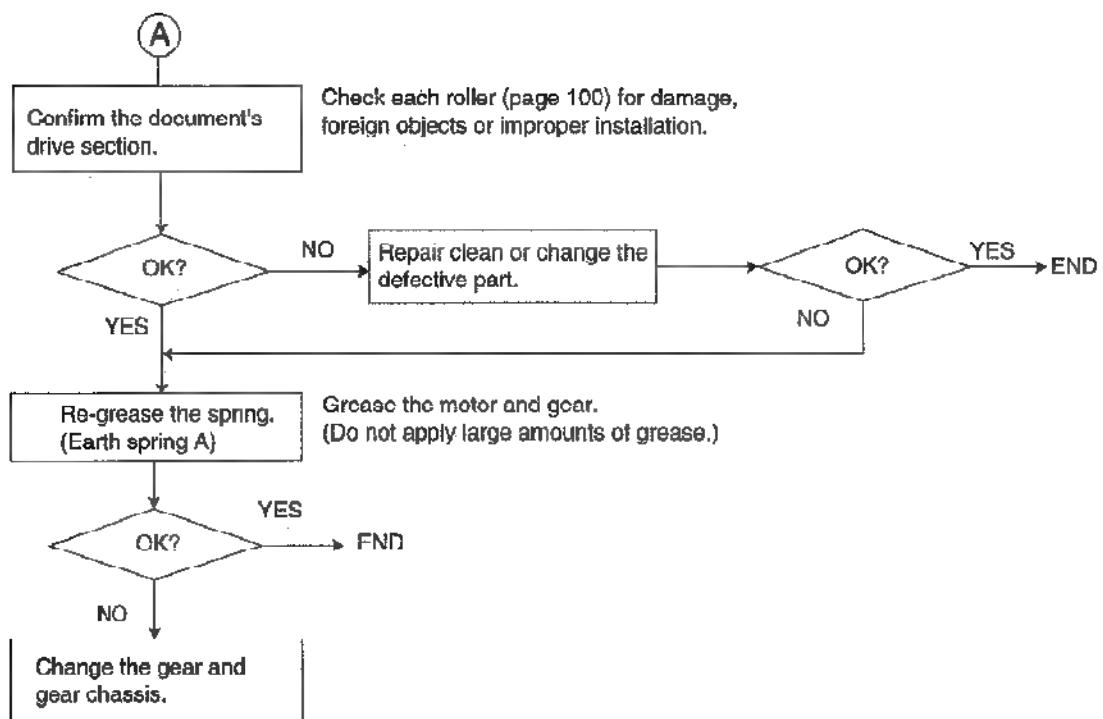


**(9) Expanded print (When printing)**



**(10) When copying or printing, an abnormal sound is heard from the unit.**





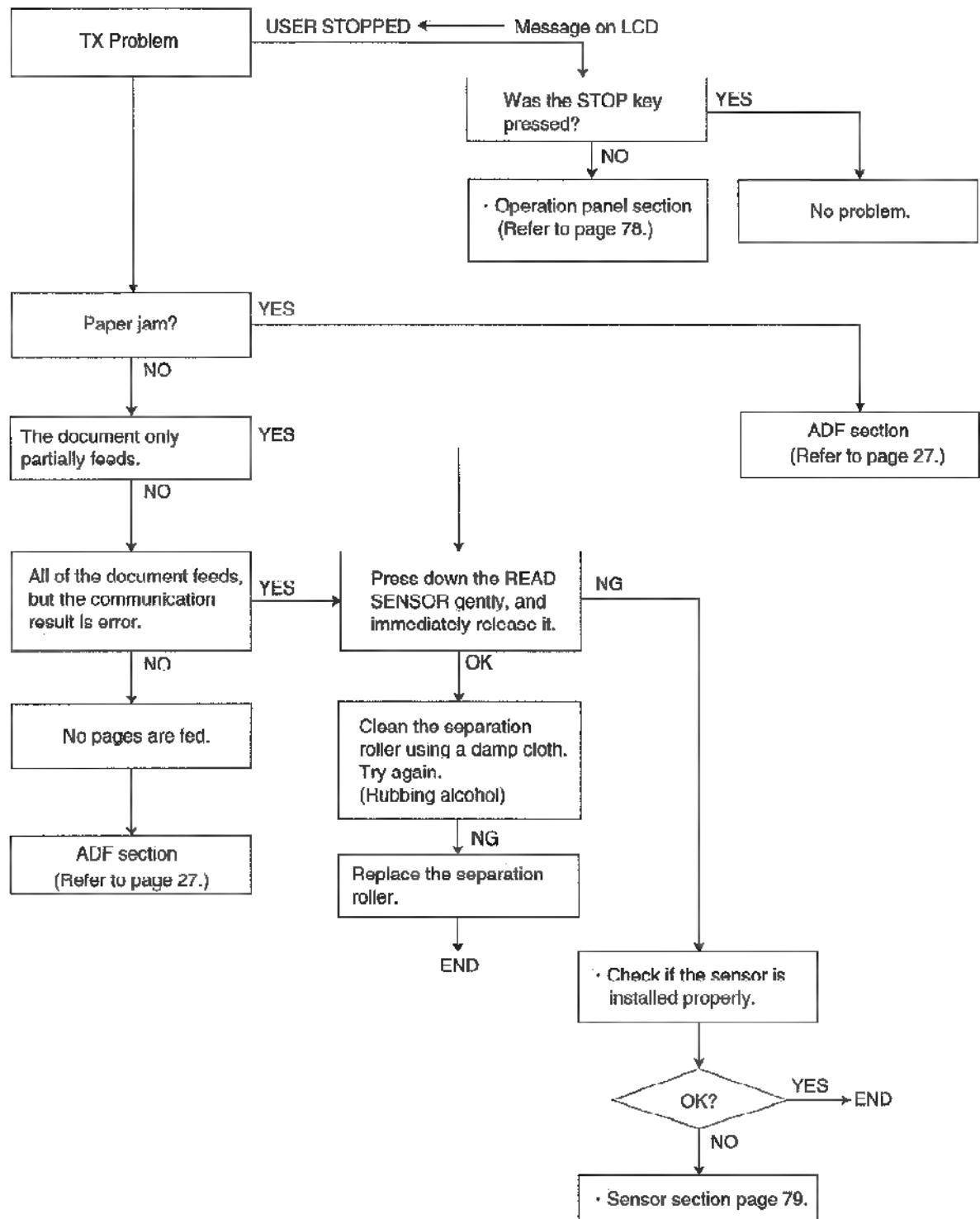
**3-6 COMMUNICATION SECTION**

Find the problem in the table shown below, and refer to the corresponding troubleshooting procedure in the reference pages (pages 37-52).

No.	Symptom	Ref. page	Content	Possible cause
1	The paper does not feed properly when faxing. (Copying is also not possible.)	37	Troubleshooting	Problem with the feeding mechanism.
2	The fax transmits successfully one time and fails another. (Copying is possible.)	38	Troubleshooting	Problem with the service line or the receiver's fax.
3	The fax receives successfully one time and fails another. (Copying is possible.)	39	Troubleshooting	Problem with the service line or the transmitter's fax.
4	The fax completely fails to transmit or receive. (Copying is possible.)	40	Troubleshooting	Electronic problem.
5	The fax fails either to transmit or receive when making a long distance or international call. (Copying is possible.)	41-43	Detailed description of the possible causes (Similar to troubleshooting items No.2 and No.3.)	Problem with the service line.
6	When the other error code is appeared.	44-52	Troubleshooting procedure for each error code printed on the communication result report.	

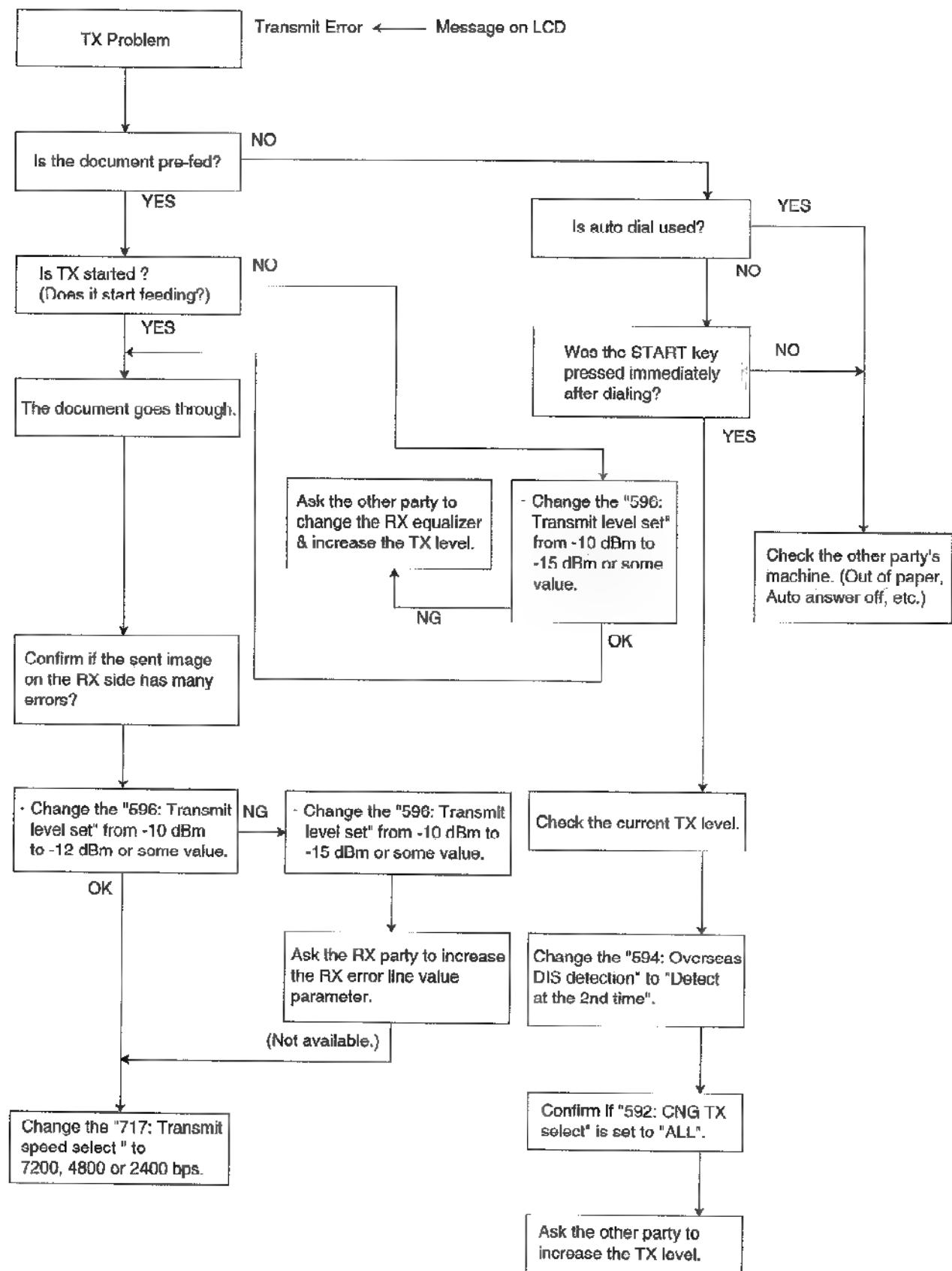
## (1) Defective facsimile section

## ① Transmit problem



## KX-FT37AL

### ② Sometimes there is a transmit problem.



### ③ Receive problem

Confirm the following before starting troubleshooting.

- Is the recording paper installed properly?

There is the receiving problem when sometimes the below errors maybe occurred.

OUT OF PAPER

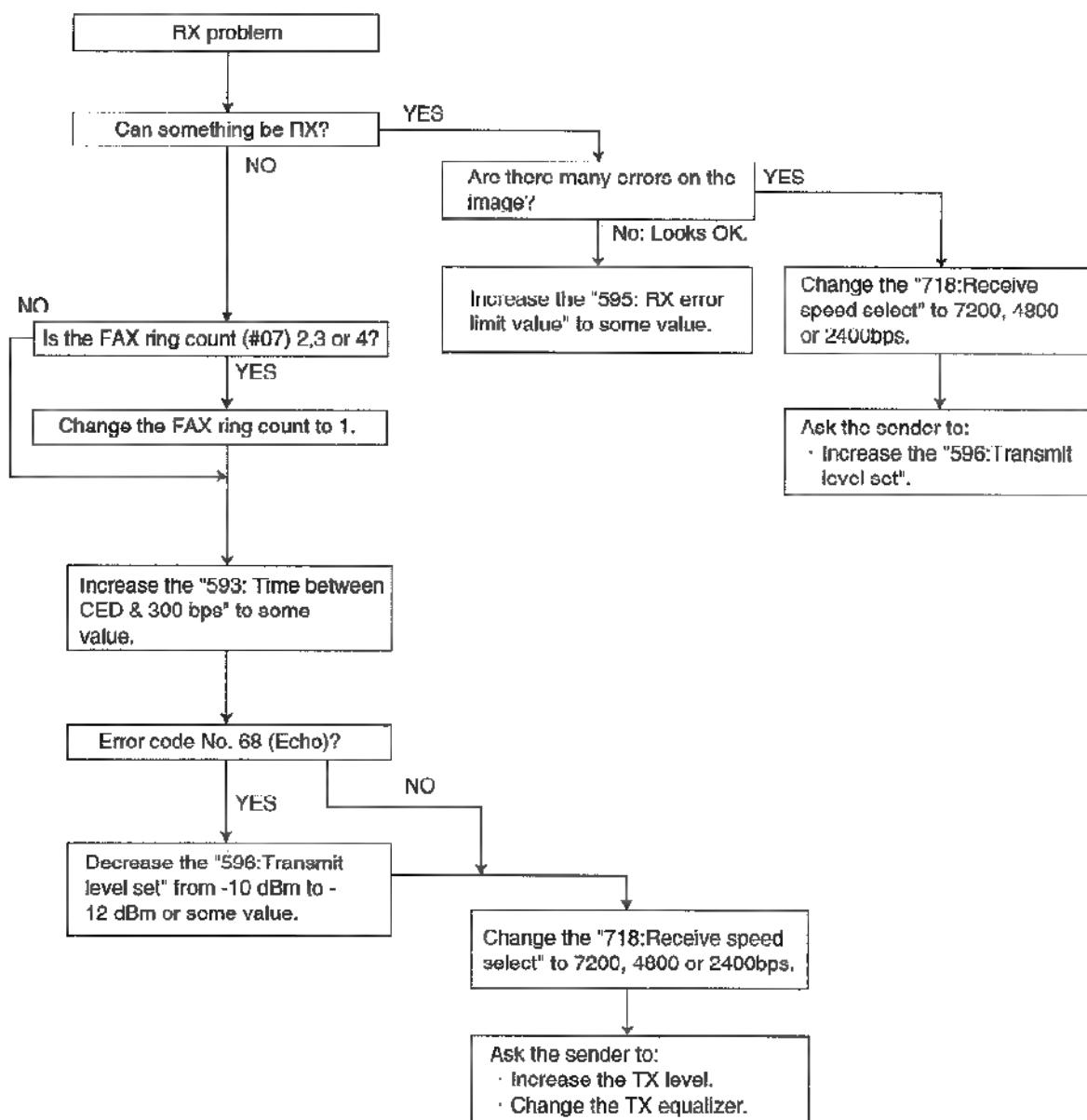
CHECK COVER

Unit OVERHEATED (If it doesn't return automatically, COVER OPEN, etc., reset the unit.)

CHECK DOCUMENT

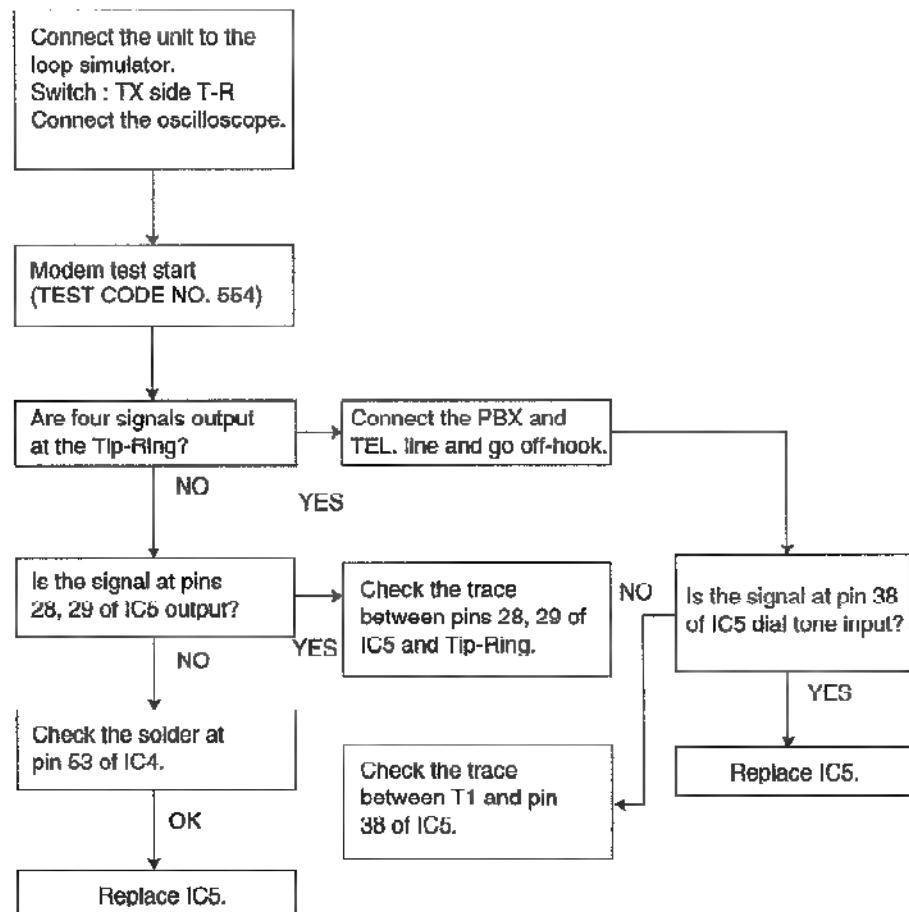
PAPER JAMMED

Please refer to "2. User Recoverable Errors" (page 23) for the above items.  
Also, when hardware deformity occurs, please check each sensor.



## KX-FT37AL

④ The unit can copy, but cannot transmit/receive.

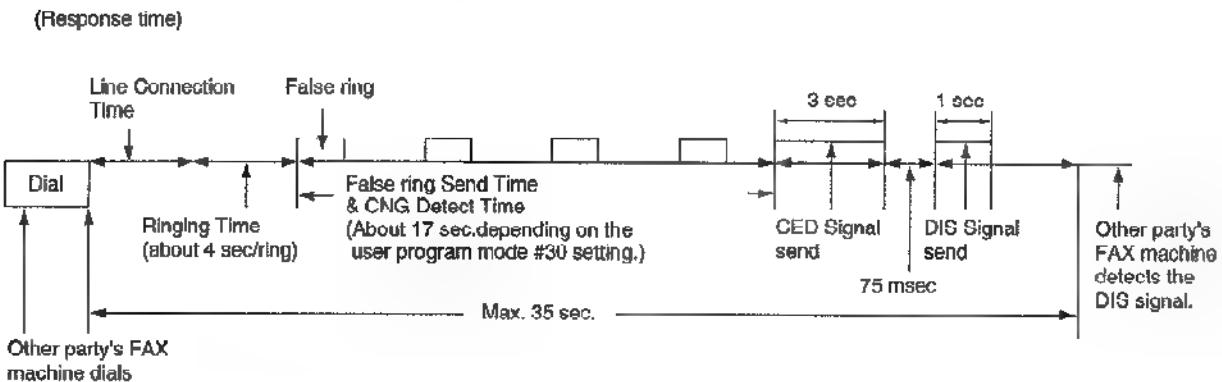


⑤ Unit can copy, but cannot transmit/receive long distance or international communications.

The following 2 causes can be considered for this.

**Cause 1:**

The other party is executing automatic dialling, the call has been received by this unit, and the CED or DIS signal response time is too long. (In most cases, this unit detects the CNG signal and can respond to the CED or DIS.) (According to the ITU-T standard, the communication procedure is stopped when there is no response from the other party within 35 sec, so that the other party releases the line.)



TROUBLESHOOTING GUIDE

**(Cause and Countermeasure)**

As shown in the chart above, the total handshaking time must be reduced. Long distance connection and linking of several stations means the line connection time cannot be reduced. Accordingly, the following countermeasures should be attempted.

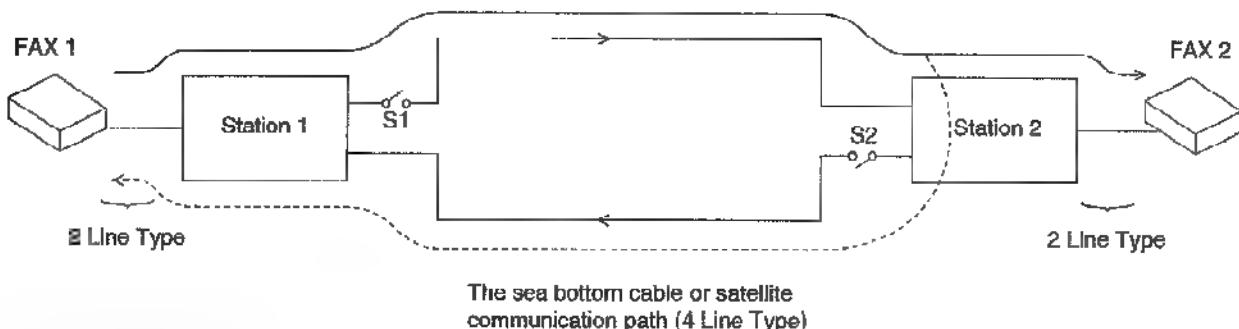
(A) The TEL/FAX DELAYED RING count should be 1. (User parameter: code No. 09)

(D) As the 35 sec. count starts directly after dialling or directly after the START button has been pressed for models with a START button, the other party should be called manually, if possible.

Another possibility is entering two pauses at the end of the auto dial number on the transmission side. Then the count start time will be delayed for 2 pauses (about 10 sec.).

**Cause 2:**

Erroneous detection due to an echo or echo canceller.



**(Echo/Echo Canceller)**

The signal from FAX1 reaches FAX2 via the stations 1 and 2, but the reflection signal at station 2 also returns via station 1 (echo). As the distance between station 1 and station 2 is far, the echo returns to FAX 1 a max. of 600 msec after transmission. There is a possibility that this signal is detected erroneously as the signal from FAX2. For a normal call, there is a possibility that the echo of their own voice will make the call difficult to understand. For this reason, each station (station 1, station 2) attaches echo cancellers (S1, S2) for international lines or long distance lines. For the echo canceller, the level of the transmission signal from FAX 1 is compared with the level of the reception signal from FAX2. When the transmission signal is larger, S1 is closed while S2 is opened when it is smaller. In other words, for transmission from FAX1, S1 is closed and S2 is open, so that the echo does not return to FAX1.

## KX-FT37AL

### (Cause and Countermeasure)

#### (Cause A)

When a training signal is transmitted from FAX1 during the communication procedure at the time of transmission from FAX1 to FAX2, there is a delay until the echo canceller operates. S1 is closed so that a part of the head of the training signal may drop out. Normal reception by FAX2 may not be possible, and transmission may not be started.

#### (Countermeasure A)

When the international line mode is ON in the service mode (code No. 521), a dummy signal is attached to the head of the training signal to prevent this problem. As this normally is ON, it is necessary to reconfirm that this has not become OFF. When the international mode is switched OFF, the transmission side will try the training signal three times at each speed (9600BPS, 7200BPS, 4800BPS and 2400BPS). If NG, it will drop the speed by one rank (fall-back). When the international mode is switched ON, each speed will be tried only twice. In other words, the slower speed with fewer errors can be accessed more easily. This is done because the line conditions may deteriorate and the picture may be affected more easily during communication for international lines or long distance communication, even when the training is OK. The default value is ON as preference is given to clearer pictures rather than speed.

#### (Cause B)

The echo canceller operation is stopped with a 2100Hz signal (i.e. S1 and S2 become ON).

Accordingly, when FAX1 has executed automatic reception, a CED signal is output. If this signal is 2100Hz, S1 and S2 will become ON. Then the echo of the DIS signal output afterwards may be received and FAX1 may execute an erroneous operation, preventing communication from starting.

#### (Countermeasure B)

In the service mode, the time setting between the CED signal and the DIS signal is set from 75 msec to 600 msec in the service mode (code No.593). This is because the echo canceller operation stop mode is cancelled by an interval of 250 msec or more.

Reduce receiving sensitivity to reduce the effect of RCV echo signal. (service mode: code No. 598)

#### (Cause C)

This model is FAX1 and the other party is FAX2.

For transmission from FAX1 to FAX2, FAX2 executes automatic reception and transmits a CED signal (2100 Hz) followed by a DIS signal. As the echo canceller stops as described in cause B, the echo of the DIS signal returns to FAX2. On the other hand, FAX1 detects the DIS signal and transmits a DCS signal. In other words, it is possible that the echo of the DIS signal and the DCS signal transmitted from FAX1 reach FAX2 one after the other. FAX2 detects an error and communication is not started.

#### (Countermeasure C)

When the international DIS detection setting is set in the service mode (code No.594), FAX1 does not respond to the first DIS signal and returns a DCS signal only for the second DIS signal.

In other words, there is an interval of 250 msec between transmission of first and second DIS signal so that the echo canceller's operation recovers. An echo is not generated for the second DIS signal.

#### Note:

When the other FAX does not respond with a DCS signal after DIS signal transmission, the DIS signal is transmitted three times for trial.

**Summary:**

Long distance and international communication operation

SYMPTOM	COUNTERMEASURE
Does not receive in the automatic mode.	<ol style="list-style-type: none"> <li>1. The TEL/FAX DELAYED RING count should be 1. (User parameter: code No. 09)</li> <li>2. If possible, manual transmission should be made from the transmission side.</li> <li>3. If possible, two pauses should be inserted at the end of the auto dial number on the transmission side.</li> <li>4. If possible, the Function Selector Switch should be switched to FAX.</li> </ol>
Does not transmit.	<ol style="list-style-type: none"> <li>1. Confirm the international line mode is ON. (Service mode: code No. 521)</li> <li>2. Enable the International DIS detection setting. (Service mode: code No. 594)</li> </ol>
Does not receive.	<ol style="list-style-type: none"> <li>1. Set the time setting between the CED signal and the DIS signal to 500 msec. (Service mode: code No. 593)</li> <li>2. Reduce the RCV sensitivity. (Service mode: code No. 598)</li> </ol>

## TROUBLESHOOTING GUIDE

⑥ The unit can copy, but the transmission and reception image is incorrect.  
(Long distance or international communication operation)

This depends widely on the transmission and reception capability of the other FAX unit and the line conditions.  
The countermeasures for this unit are shown below.

**Transmission Operation:**

Set the transmitting speed to 4800BPS (Service mode: code No. 717) or select the overseas mode.

**Reception Operation:**

If 80% or more of the reception is incorrect, set the receiving speed to 4800BPS. (Service mode: code No. 718)

## KX-FT37AL

### (2) Communication error functions

#### ① How to output the Journal Report:

1. Press the MENU button 2 times.
2. Press the START/SET button and then ▼ button until JOURNAL REPORT is displayed.
3. Press the START/SET button.
4. The journal will print out, listing any errors.

#### Sample of a journal report

JOURNAL							FEB. 09 1998 08:38PM	
NO.	OTHER	FACSIMILE	START TIME	USAGE TIME	MODE	PAGES	RESULT	*CODE
01	222		01 ENE. 01:08AM	00'54	RCV	00	COMMUNICATION ERROR(43)	

(3)  
SND: Sent directly.  
RCV: Received directly

(2) Communication message

(1) Error code

#### Error code table:

(1) CODE	(2) RESULT	(3) MODE	SYMPTOM	Counter- measure (go to the next page)
	PRESSED THE STOP KEY	SND & RCV	Communication was interrupted by the STOP button.	
	DOCUMENT JAMMED	SND	The document paper is jammed.	
	NO DOCUMENT	SND	No document paper.	
	PRINTER OVERHEATED	RCV	The thermal head is overheated.	
	PAPER OUT	RCV	Out of thermal paper.	
	THE COVER WAS OPENED	SND & RCV	The cover is open.	
	OTHER FAX NOT RESPOND	SND	Transmission is stopped when the T1 TIMER expires.	
	MEMORY FULL	RCV	The document was not received due to memory being full.	
	PAPER OUT	RCV	The unit ran out of recording paper. Install a recording paper roll	1
41	COMMUNICATION ERROR	SND	DCN is received after DCS transmission.	2
42	COMMUNICATION ERROR	SND	FTT is received after transmission of 2400BSP training signal.	3
43	COMMUNICATION ERROR	SND	No response after post message is transmitted three times.	4
44	COMMUNICATION ERROR	SND	RTN and PIN are received.	5
46	COMMUNICATION ERROR	RCV	No response after FTT is transmitted.	6
48	COMMUNICATION ERROR	RCV	No post message.	7
49	COMMUNICATION ERROR	RCV	RTN is transmitted.	8
50	COMMUNICATION ERROR	RCV	PIN is transmitted (to PRI-Q).	8
51	COMMUNICATION ERROR	RCV	PIN is transmitted.	8
52	OTHER FAX NOT RESPOND	RCV	Reception is stopped when the T1 TIMER expires.	■
53	ERROR - NOT YOUR UNIT	SND	DCN is received after transmission of NSC and DTC.	10
54	ERROR - NOT YOUR UNIT	RCV	DCN is received after DIS transmission.	11
57	COMMUNICATION ERROR	SND	300BPS error	12
58	COMMUNICATION ERROR	RCV	DCN is received after FTT transmission.	13
59	ERROR - NOT YOUR UNIT	SND	DCN responds to a post message.	14
64	COMMUNICATION ERROR	SND	Polling is not possible.	15
68	COMMUNICATION ERROR	RCV	No response at the other party after MCF or CFR is transmitted.	13
70	ERROR - NOT YOUR UNIT	RCV	DCN is received after CFR transmission.	13
72	COMMUNICATION ERROR	RCV	The carrier is cut when the image signal is received.	16
FF	COMMUNICATION ERROR	SND & RCV	Modem error.	12

SND=TRANSMISSION RCV=RECEPTION

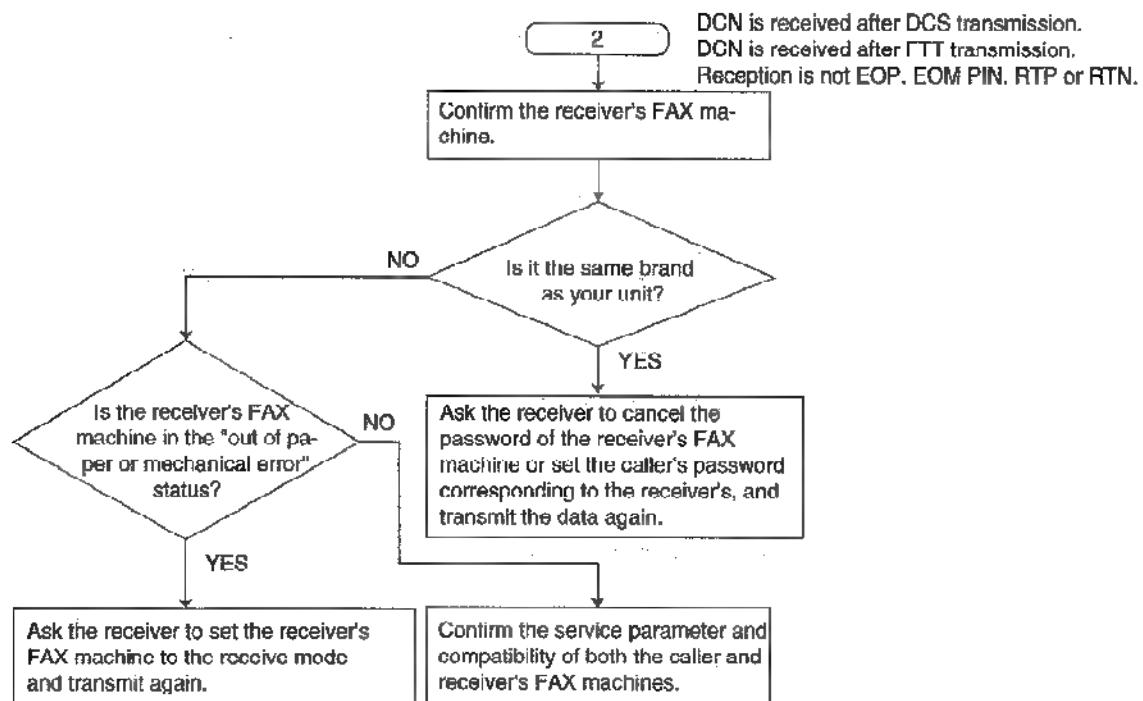
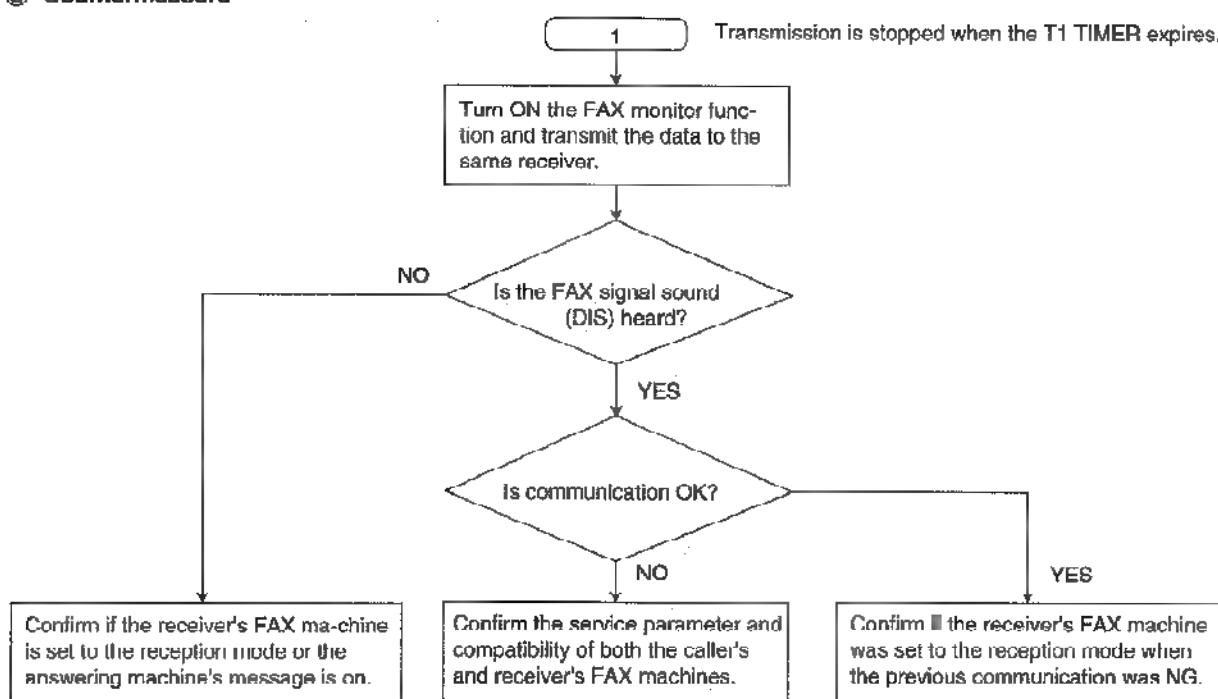
\*Most fax communication problems can be resolved by the following steps.

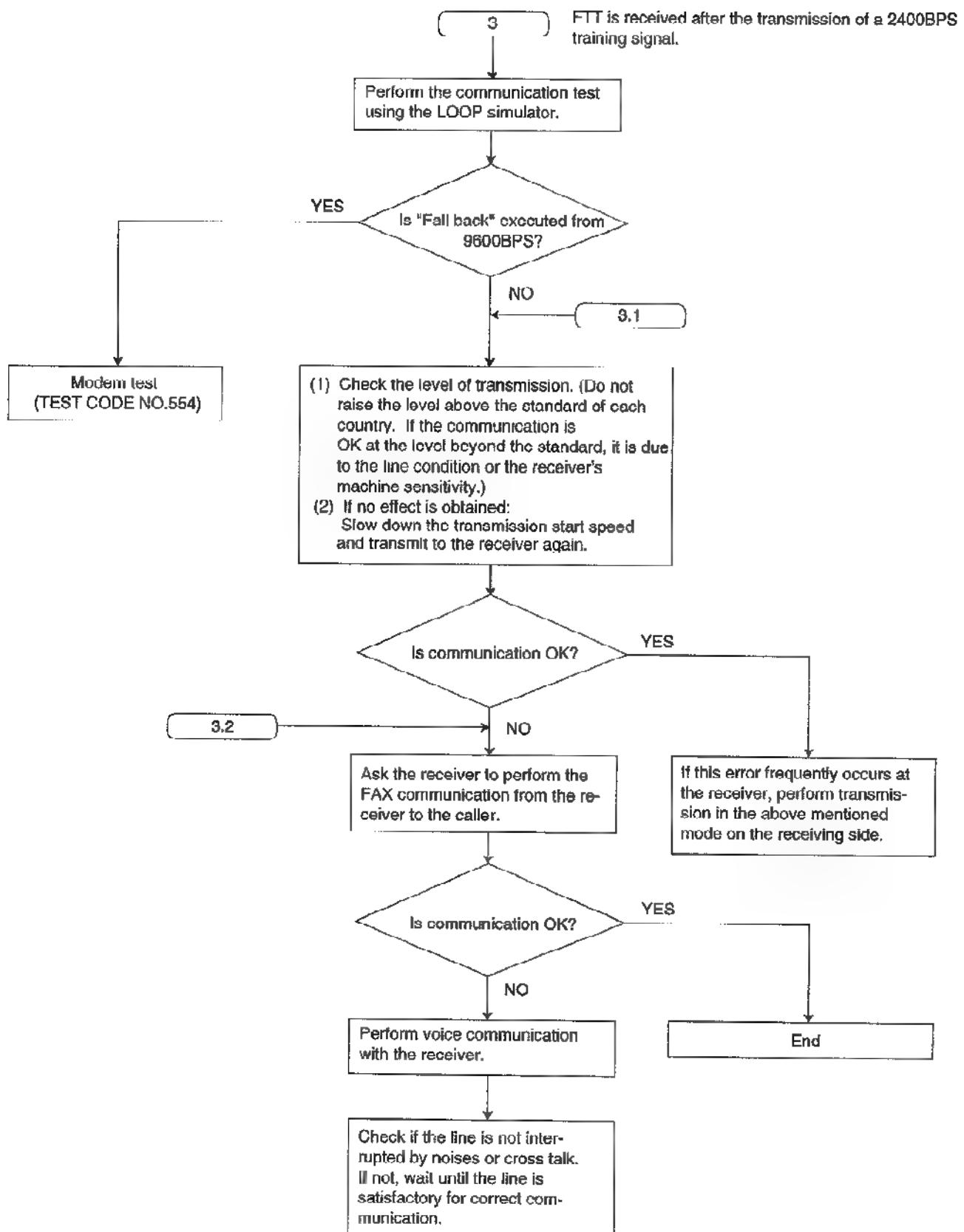
1) Change the transmit level. (Service code: 596, refer to page 86.)

2) Change the TX speed/RX speed. (Service code: 717/718, refer to page 87.)

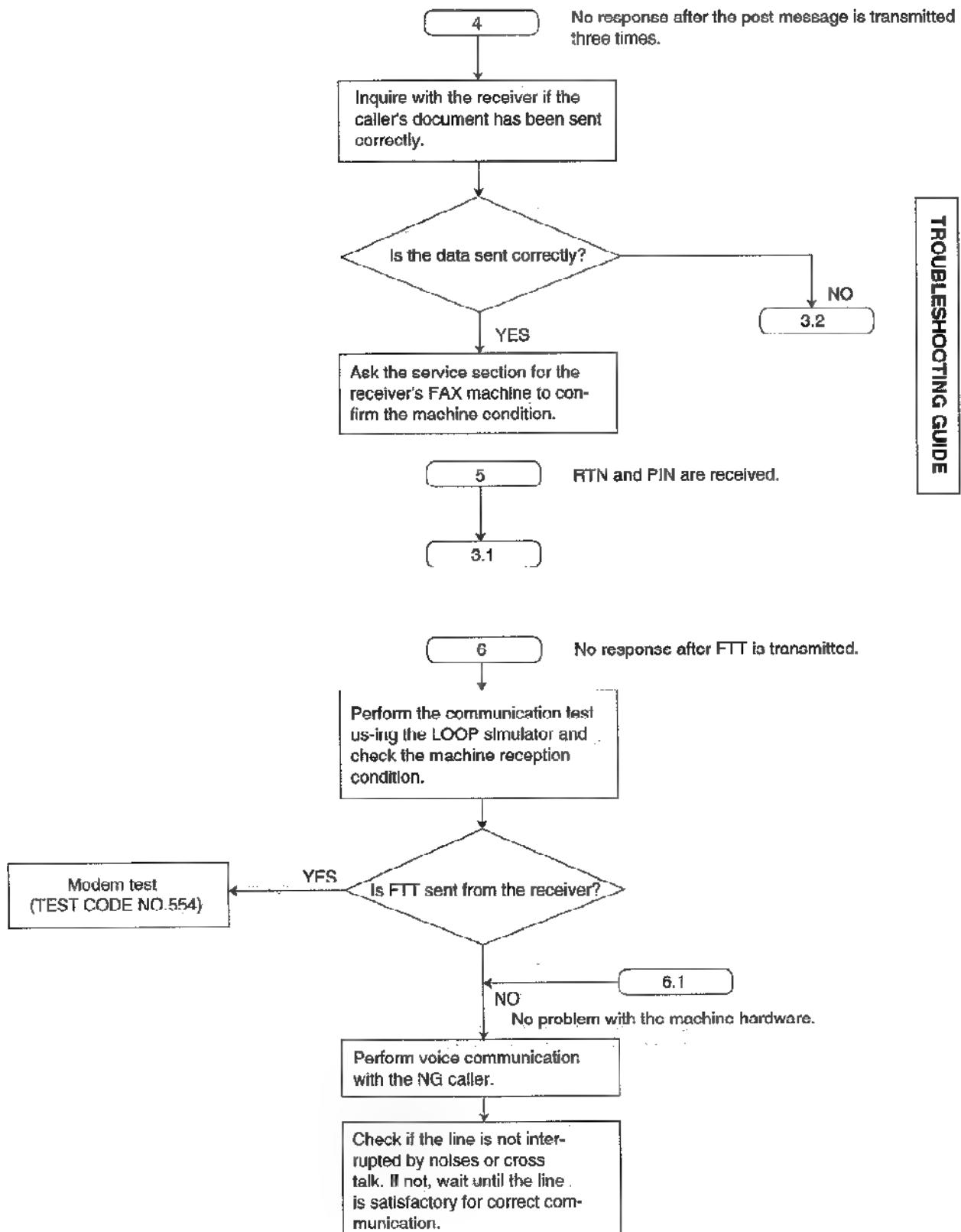
If the problem remains, see the next page.

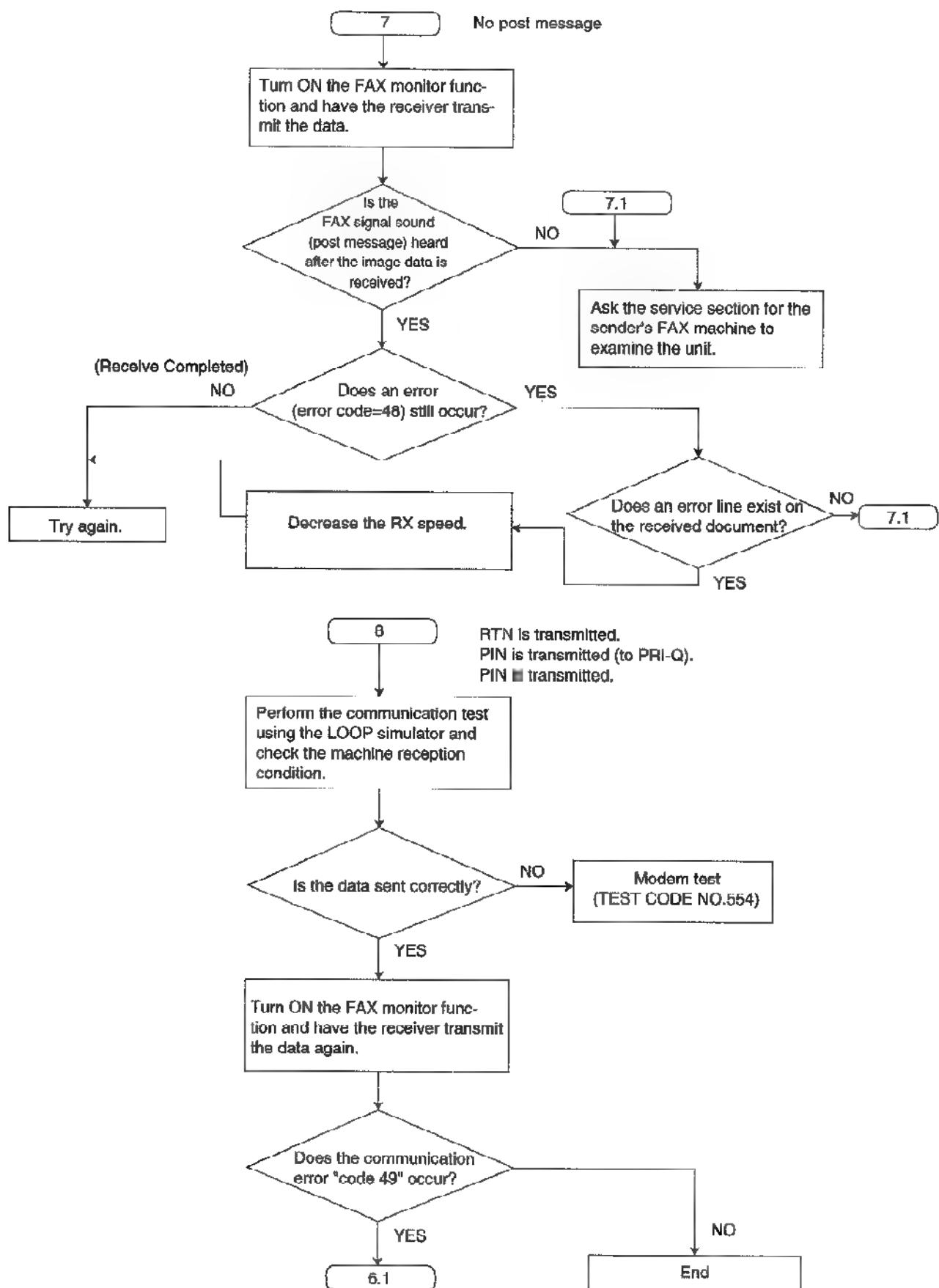
## ③ Countermeasure

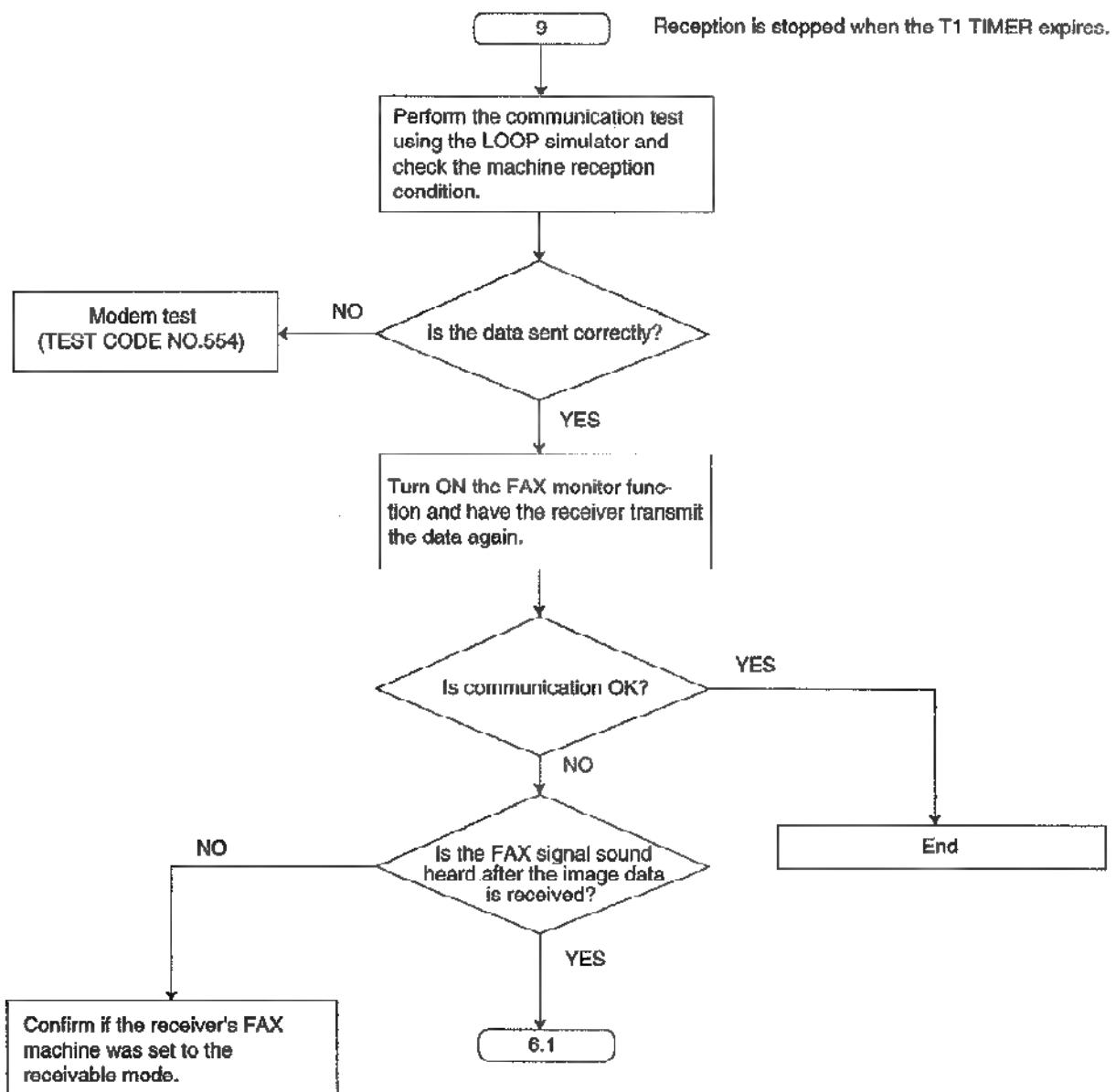


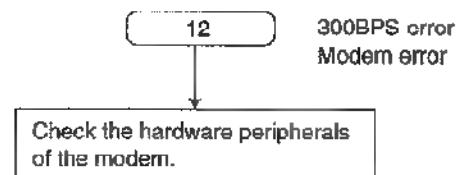
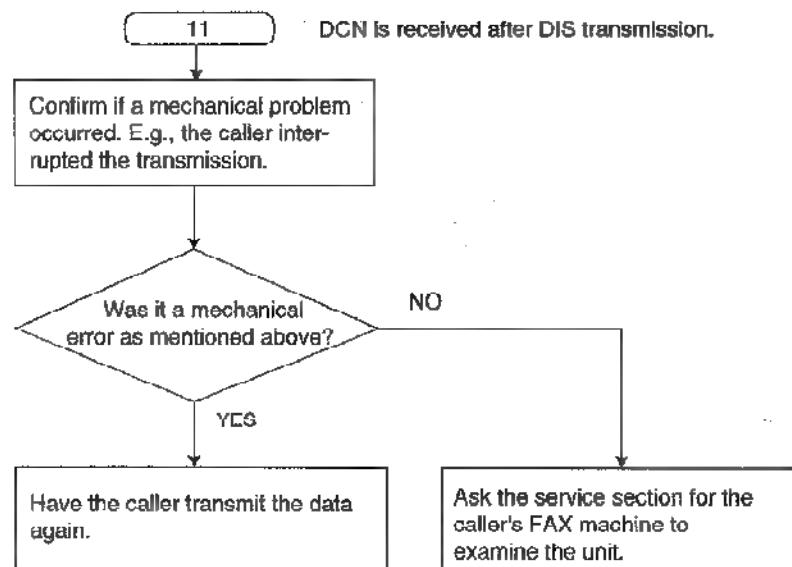
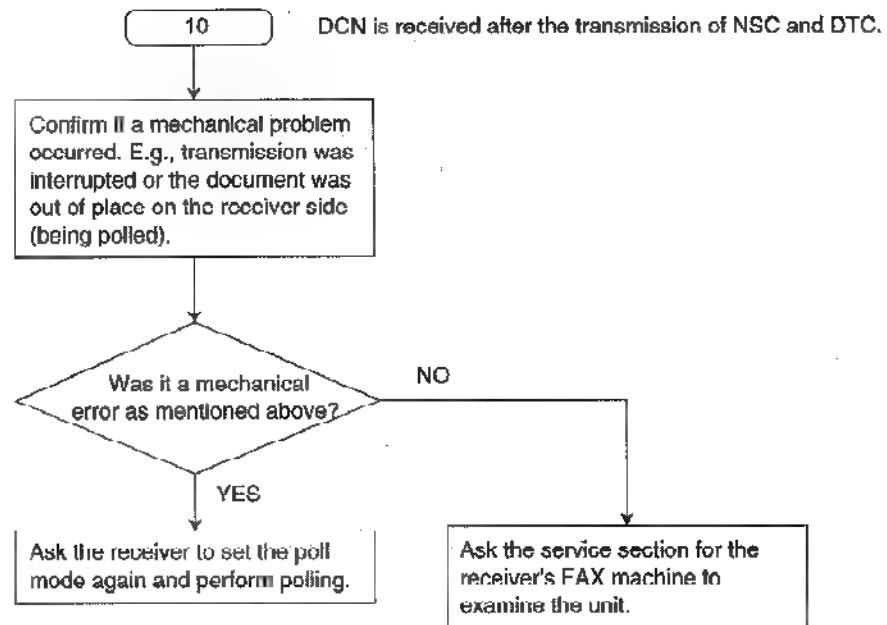


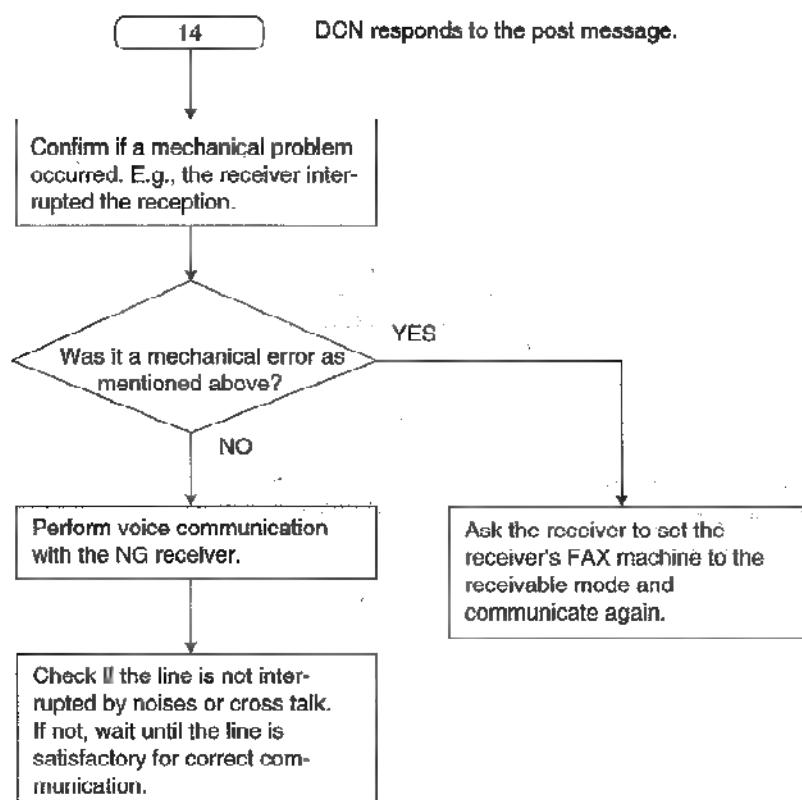
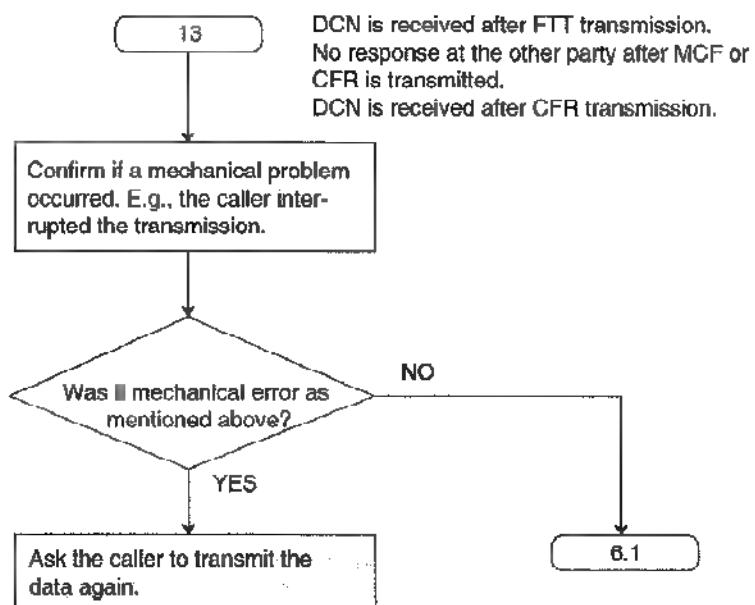
## TROUBLESHOOTING GUIDE

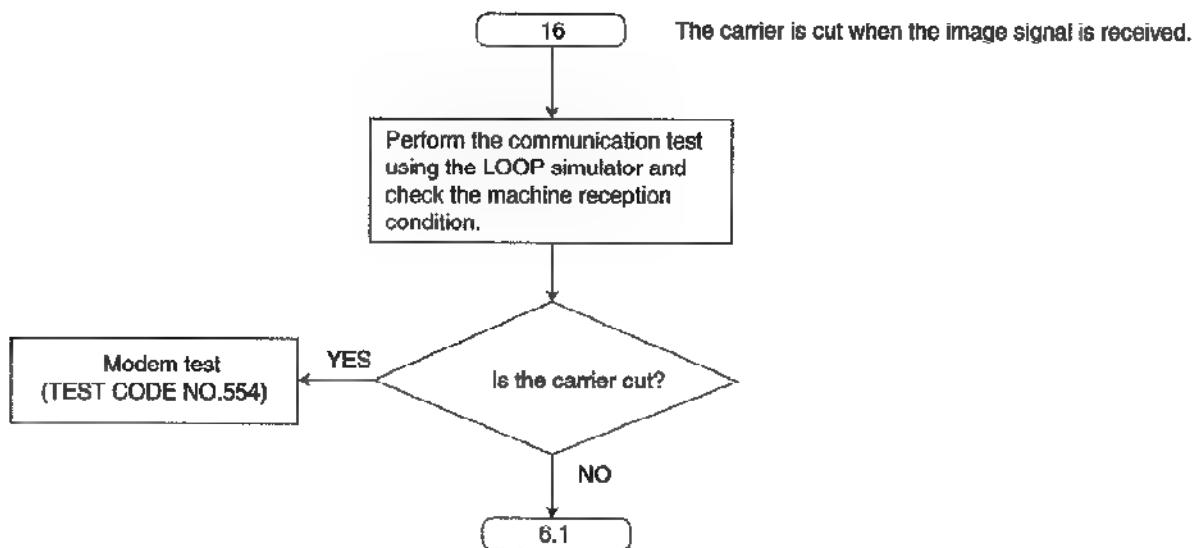
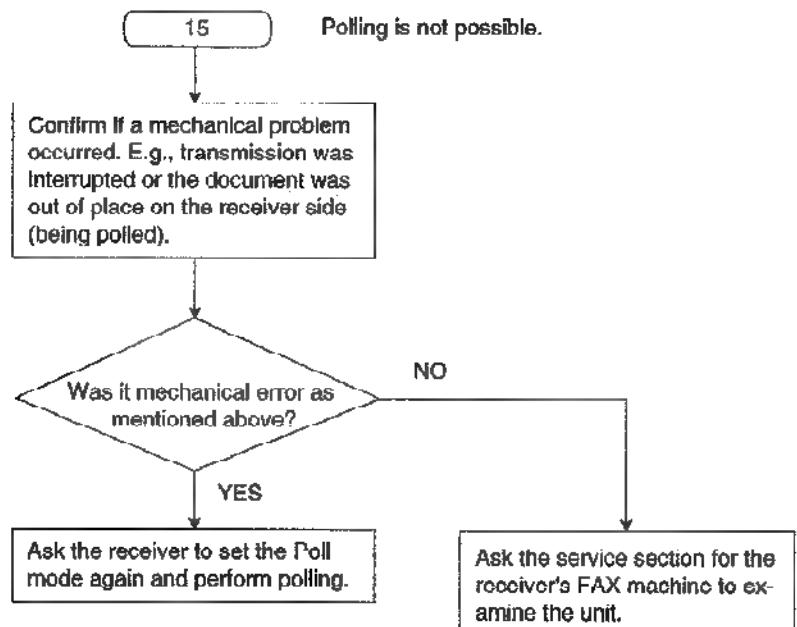


**KX-FT37AL**



**KX-FT37AL**





### (3) Remote programming

If, after the call is connected, the customer describes the situation and it is determined that the problem can be corrected by making parameter changes, this function makes it possible to change parameters such as the user code and service code from another fax (using DTMF tones). Therefore, travel to the customer's location is not required. However, it is not possible to change all the parameters remotely (② Program mode table: refer to page 55). The function used to accomplish this is remote programming.

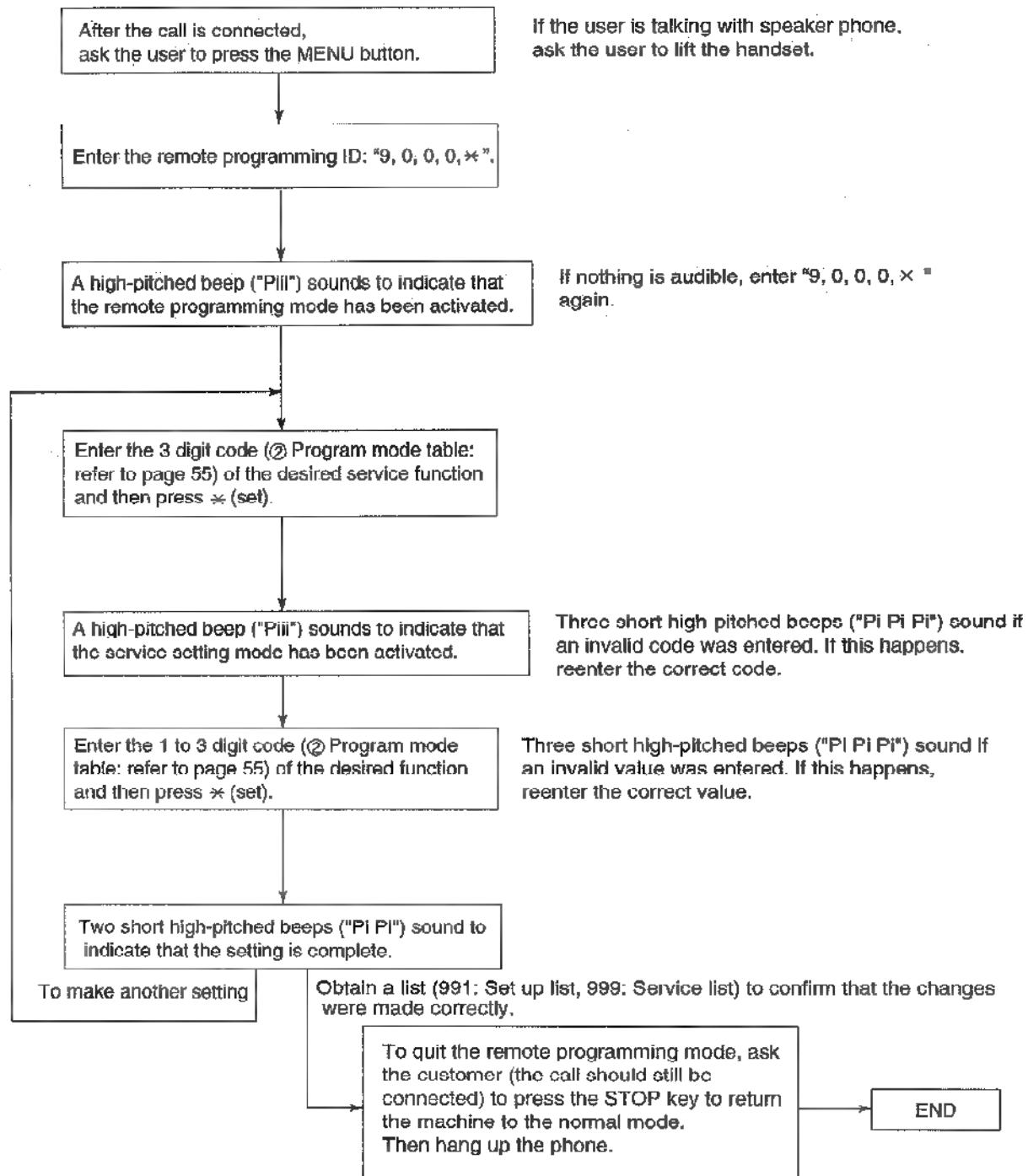
First, in order to check the current status of the service code parameter, output the setup list (code: 991) and service list (code: 999) from the customer's fax machine. Based on this, the parameters for the desired codes can be changed. The procedure for changing and listing parameters is described on the next page. Also, before exiting the remote programming mode, it is advisable to obtain a new list to confirm that only the desired parameters were changed.

#### Hint:

Since the connected telephone is in use during the remote programming mode, it may be helpful to ask the customer to switch to the speakerphone (except for a digital speakerphone). This frees the customer from the need to remain right next to the fax while you are making parameter settings. When finished, inform the customer. Also note that in very noisy locations where the DTMF tones are not audible, the remote programming function will not work.

## KX-FT37AL

### ① Entering the remote programming mode and changing service codes.



## ② Program mode table

Code	Function	Set Value	Default	Remote setting
001	Set the date and time	mm/dd/yy hh:mm	-----	NG
002	Your logo	-----	-----	NG
003	Your telephone number	-----	-----	NG
004	Print transmission report	1:ERROR 2:ON 3:OFF	ERROR	OK
005	Auto receive mode	1:TAD/FAX 2: FAX ONLY	TAD/FAX	OK
006	TAD/FAX ring count	2~9:TOLL SAVER/RINGER OFF	2	OK
007	FAX ring count	2 to 9 rings	2 ring	OK
008	Manual receive mode	1:TEL 2:TEL/FAX	TEL	OK
009	TEL/FAX delayed ring	2 to 9 rings	2 ring	OK
010	Recording time	1:VOX/2:1 MIN	VOX	OK
011	Remote ANS ID	-----	ID=111	NG
022	Journal auto print	1:ON 2:OFF	ON	OK
023	Overseas mode	1:ON 2:OFF	OFF	OK
025	Delayed send	ON/OFF	OFF	NG
026	Auto caller list	1:ON 2:OFF	ON	OK
030	Silent FAX recognition ring	3 to 9 rings	3 rings	OK
031	Ring detection	ON/OFF	ON	OK
039	LCD contrast	NORMAL/LIGHT/DARK	NORMAL	NG
041	FAX activation code	ON/OFF	ON/ID= *9	NG
042	Message alert	1:ON 2:OFF	OFF	OK
043	REC. time alert	1:ON 2:OFF	OFF	OK
046	Friendlly reception	1:ON 2:OFF	ON	OK
047	Voice guidance	1:ON 2:OFF	ON	OK
054	Common greeting MSG. REC. time	1:16s 2:60s	16s	OK
058	Original setting	1:NORMAL 2:LIGHT 3:DARK	NORMAL	OK
060	Message transfer	MESSAGE/PAGER/OFF	OFF	NG
061	Transfer greeting	CHECK/RECORD/ERASE	CHECK	NG
067	ICM monitor	1:ON 2:OFF	ON	OK
070	FAX pager	ON/OFF	OFF	NG
076	FAX tone	1:ON 2:OFF	ON	OK
080	Set the default	YES/NO	NO	NG
501	Pause time set	001~600 X 100 msec	030	OK
502	Recall time set	01~90 X 10 msec	10	OK
503	Dial speed set	1:10pps 2:20 pps	10	OK
510	Vox time	1:6sec 2:4sec	6sec	OK
511	Vox sense	1:HIGH 2:LOW	HIGH	OK
512	Vox mode	1:A 2:B	A	OK
520	CED frequency select	1:2100Hz 2:1100Hz	2100	OK
521	International mode select	1:ON 2:OFF	ON	OK
522	Auto standby select	1:ON 2:OFF	ON	OK
523	Receive equalizer select	1:0km 2:1.8km 3:3.6km 4:7.2km	0km	OK
524	Transmission equalizer select	1:0km 2:1.8km 3:3.6km 4:7.2km	1.8km	OK
533	Setting the number of times that message transfer is redialled.	00~99	02	OK
534	Setting of the message transfer/pager call redial interval	001~999	065	OK
544	Document feed position adjustment value set	01~99 step	-----	OK
550	Memory clear	Press "START".	-----	NG
551	ROM check	Press "START".	-----	NG
553	Monitor on FAX communication select	1:OFF 2:P-B 3:ALL	OFF	OK
554	Modem test	Press "START".	-----	NG

**KX-FT37AL**

Code	Function	Set Value	Default	Remote setting
555	Scanner test	Press "START".	-----	NG
556	Motor test	Press "START".	-----	NG
557	LED test	Press "START".	-----	NG
558	LCD test	Press "START".	-----	NG
559	Document jam detection select	1:ON 2:OFF	ON	OK
560	Cutter selection	1:ON 2:OFF	ON	OK
561	Key test	Press any key.	-----	NG
562	Cutter test	Press "START"	-----	NG
563	CCD position adjustment value set	00~30 mm	-----	OK
570	Break % select	1:61% 2:67%	67%	OK
571	ITS auto redial time set	00~99	000	OK
572	ITS auto redial line disconnection time set	001~999 set	065	OK
573	Remote turn-on ring number set	01~99	15	OK
580	TAM continuous tone detection	1:ON/2:OFF	ON	OK
590	FAX auto redial time set	00~99	02	OK
591	FAX auto redial line disconnection time set	001~999	065	OK
592	CNG transmit select	1:OFF/2:ALL/3:AUTO	ALL	OK
593	Time between CED and 300 bps	1:75/2:500/3:1s	75 ms	OK
594	Overseas DIS detection select	1:1st/2:2nd	1st	OK
595	Receive error limit value set	001~999	100	OK
596	Transmit level set	15~00dBm	-11	OK
598	Receiving Seneitivity	20~48	43	OK
717	Transmit speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
718	Receive speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
719	Ringer off In TEL/FAX mode	1:ON/2:OFF	ON	OK
721	Pause tone detect	1:ON/2:OFF	ON	OK
722	Redial tone detect	1:ON/2:OFF	ON	OK
731	CPC mode	1:A / 2:B / 3:OFF	A	OK
732	Auto disconnect cancel time	1:350 msec/2:1800 msec/3:OFF	350 msec	OK
763	Friendly reception CNG detection select	1:10S/2:20S/3:30S	20S	OK
771	T1 timer	1:35 sec/2:60 sec	35 sec	OK
775	Monitoring of message transfer	1:ON/2:OFF	OFF	OK
815	Sensor check	Press "START".	-----	NG
844	Original setting	1:NORMAL/2:LIGHT/3:DARKFR	NORMAL	OK
991	Transmit basic list	1: START	-----	OK
992	Transmit advanced list	1: START	-----	OK
994	Transmit journal report	1: START	-----	OK
999	Transmit service list	1: START	-----	OK

Note: Refer to page 86 for descriptions of the individual codes.

OK means "can set".

NG means "can not set".

For example, the "004 Transmission report mode" set value "1:ERROR/2:ON/3:OFF" number corresponds to the number dialled.

### 3-7. DIGITAL BOARD SECTION

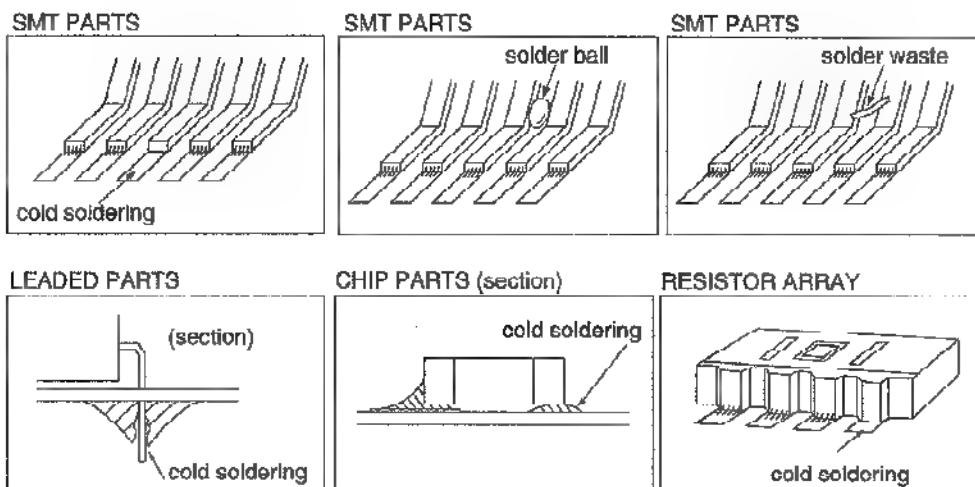
One of most difficult problems to deal with is when the system will not boot up.

The symptom: No response when the power is turned on. (No LCD display, keys are not accepted.)

Then first thing to do is check the power source. If there is no problem with the power supply unit, then there is a problem with the digital unit (main board).

As there are many potential causes in this case (ASIC, etc.), it may be difficult to specify what you should check first. If a mistake is made in the order of checks, a normal part may be determined faulty.

Although the tendency is to regard the problem as a serious one (IC malfunction, etc.), usually most problems are caused by solder faults (poor contact due to a tunnel in the solder, signal short circuit due to solder waste).



**Note:**

1. Electrical continuity may have existed at the factory check, but a faulty contact occurred as a result of vibration, etc., during transport.
2. Solder waste remaining on the board may get caught under the IC during transport, causing a short circuit.

## KX-FT37AL

### Main signals for "Boot-up"

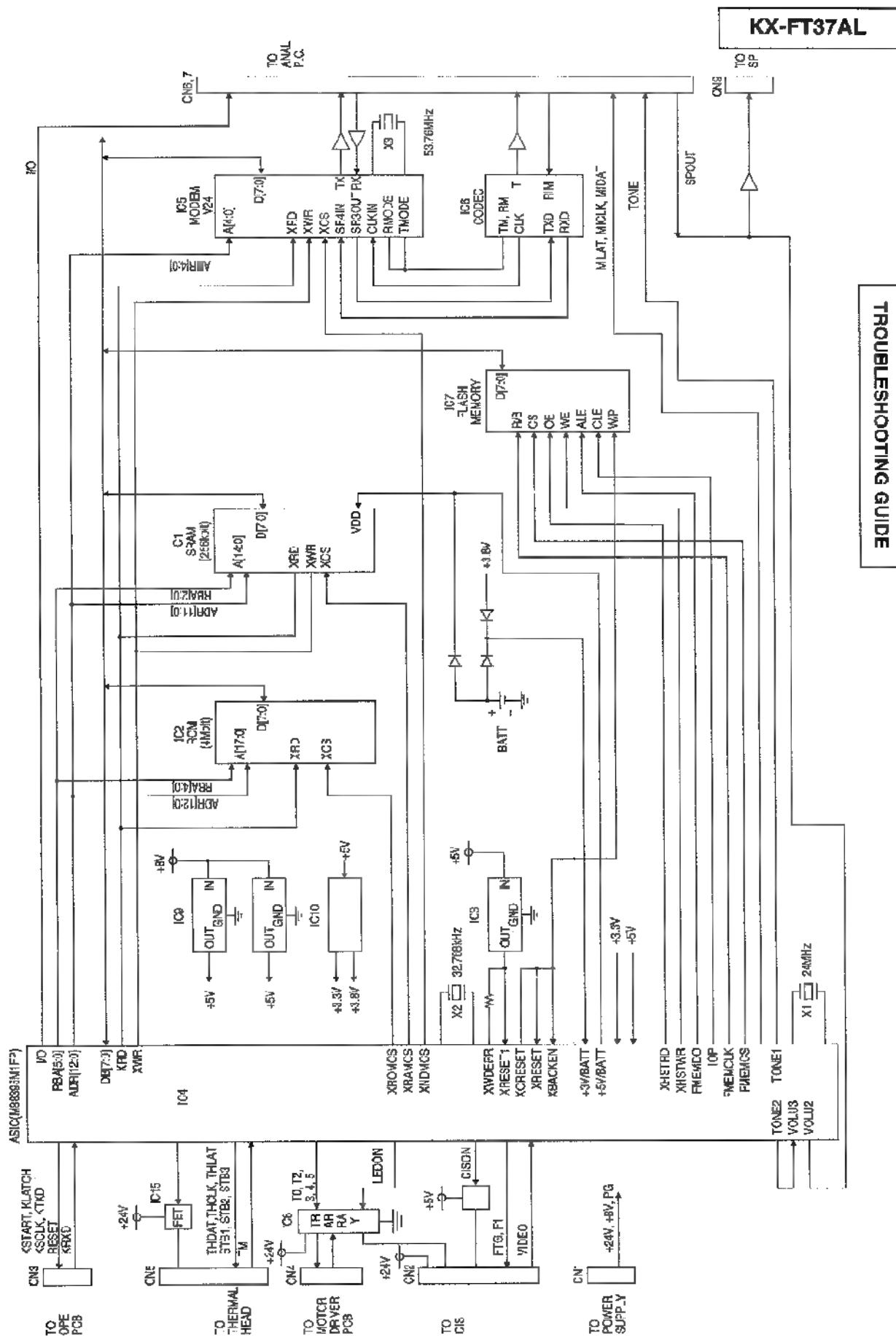
Please refer to the Block diagram.

The ASIC (including the CPU) (IC4) controls all the other digital ICs. When the power is turned on, the ASIC (CPU) retrieves the operation code stored in the ROM (IC2), then follows the instructions for controlling each IC. All ICs have some inner registers that are assigned to a certain address.

It is the address bus by which the ASIC (CPU) designates the location inside each IC. And the data bus reads or writes the data in order to transmit the instructions from the ASIC (CPU) to the ICs.

These signal lines are all controlled by voltages of 5V (H) or 0V (L).

## Digital Block Diagram



TROUBLESHOOTING GUIDE

## KX-FT37AL

The signal lines that must be normal for the system to boot up are listed here [List 1].

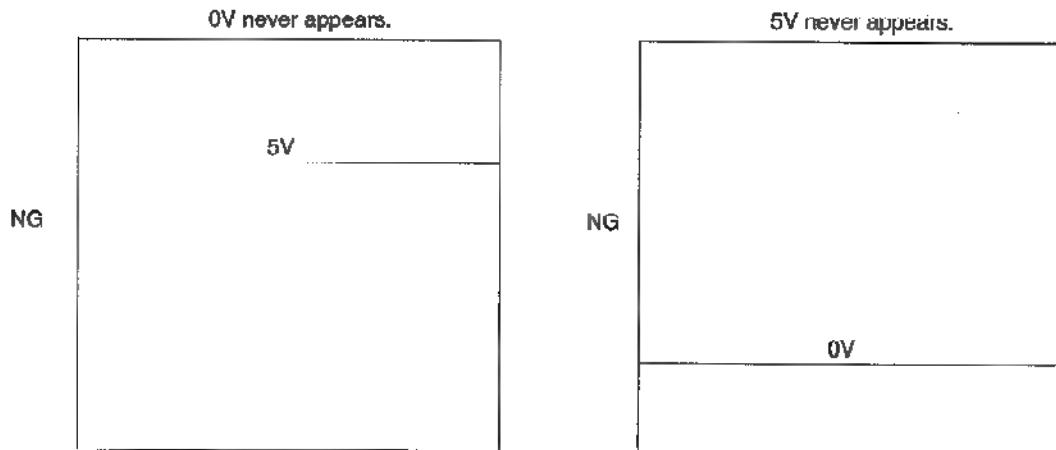
For signal lines other than these, even if they malfunction they do not directly affect booting up the system.

### [List 1]

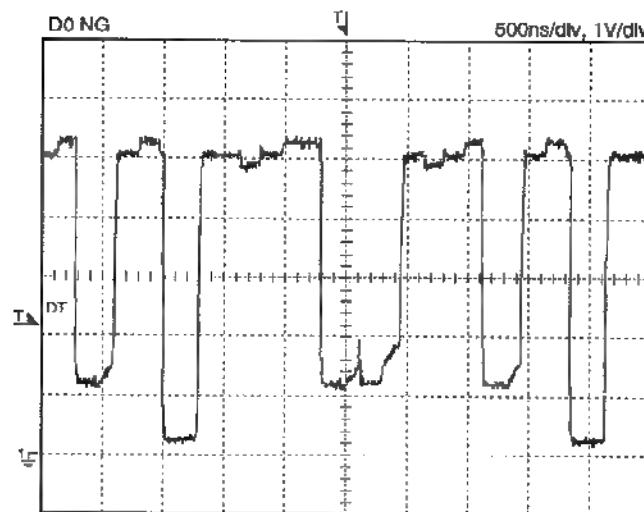
① D0~D7	(Address/Data Bus)
② A0~A15	(Address Bus)
③ RD	(Read Signal)
ROMCS	(ROM Select Signal)
WR	(Write Signal)
RAMCS	(SRAM Select Signal)
④ MDMCS	(Modem Select signal)

If these signals are normal, once the power is turned on, each IC repeatedly outputs 5V (H) and 0V (L). The following page shows NG and normal wave patterns.

### NG Wave pattern



### For a short between D0 and D1



## Normal Wave patterns

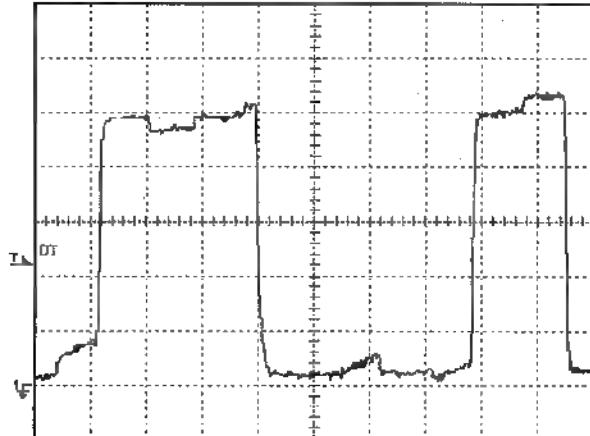
OK

## TROUBLESHOOTING GUIDE

①D0-D7

T1

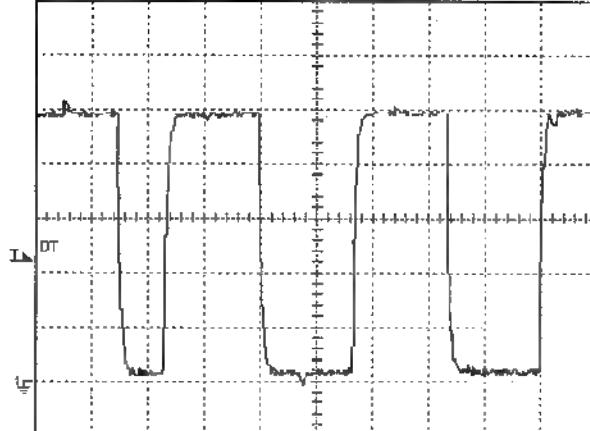
200ns/div, 1V/div



②A0-A12

T1

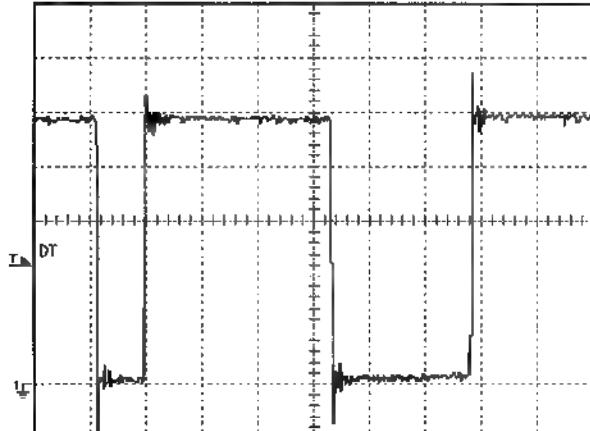
200ns/div, 1V/div



③A16

T1

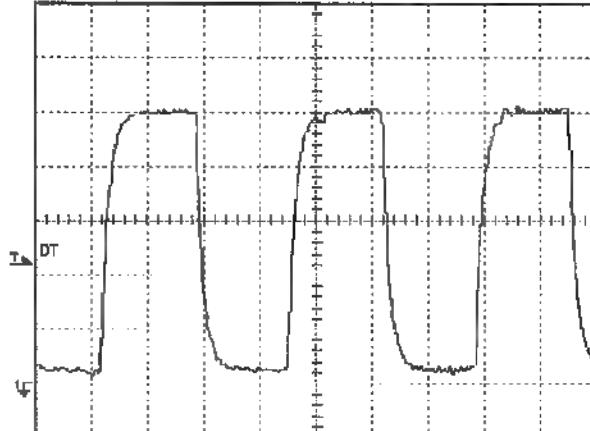
200ns/div, 1V/div



④RD/WR

T1

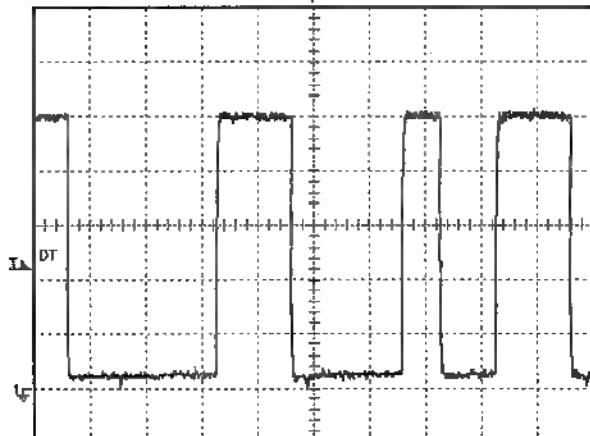
100ns/div, 1V/div



⑤ROMCS

T1

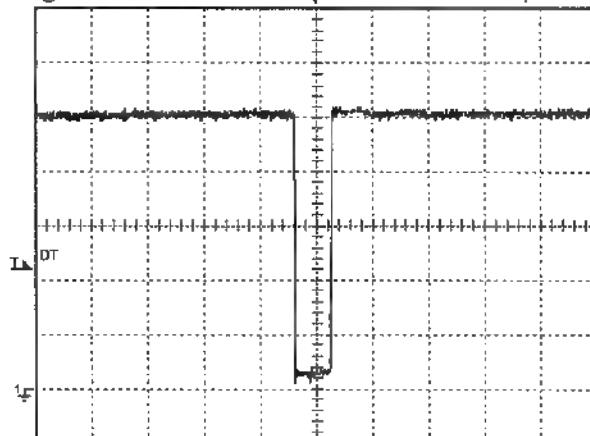
500ns/div, 1V/div



⑥MDMCS

T1

500ns/div, 1V/div



## KX-FT37AL

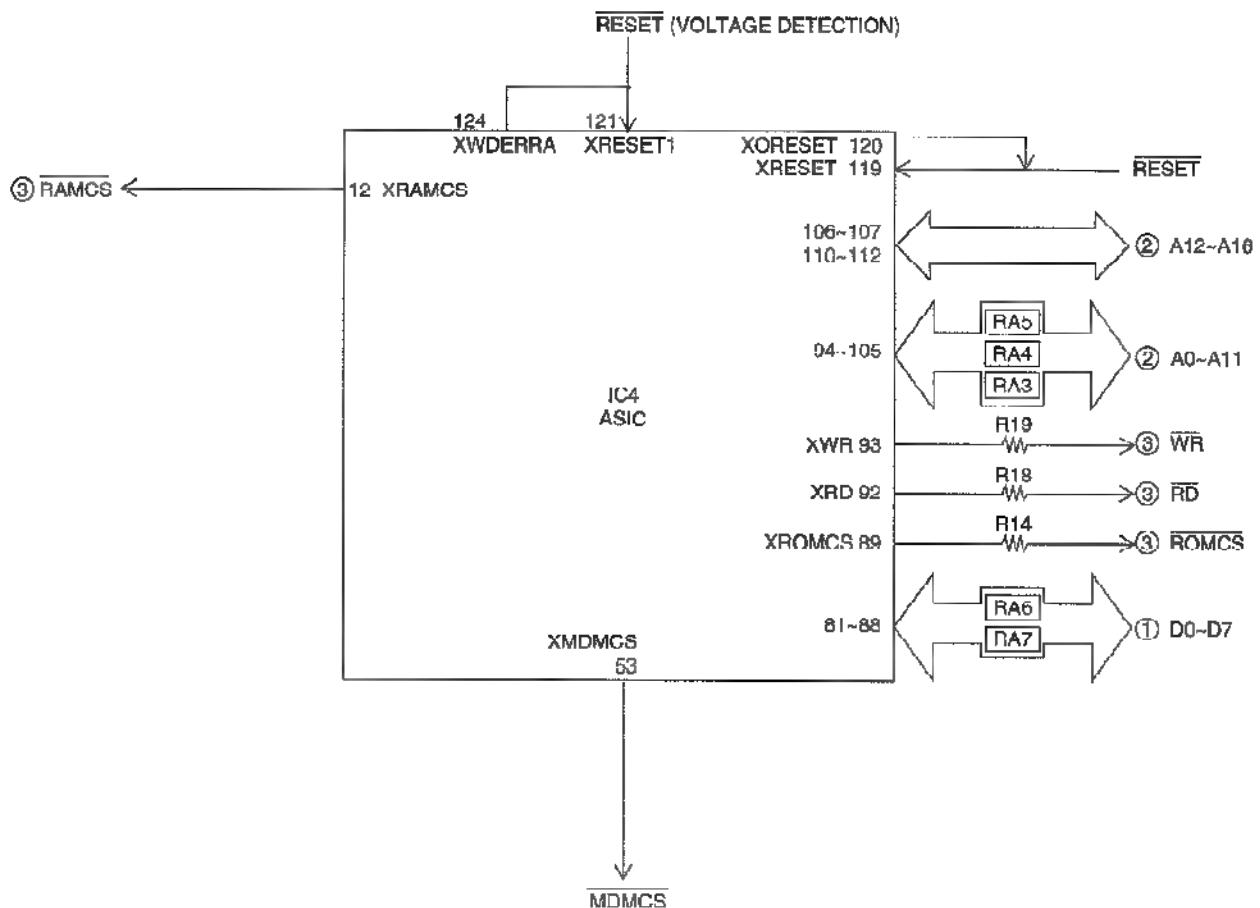
For these reasons and the software sequence to boot up the unit, if you use an oscilloscope to judge whether a signal is OK or NG, you must check in the same order as in [List 1]. (If the ASIC (CPU) failed to access the ROM, the ASIC cannot access the SRAM normally.)

The digital circuit actually operates according to the timing combinations of these signals. So, if the timing of these signals is even slightly off, the circuit will not operate normally. Even if the IC did malfunction, the output voltage level may become abnormal but the timing is accurate according to the specifications. (If oscillation is provided accurately.)

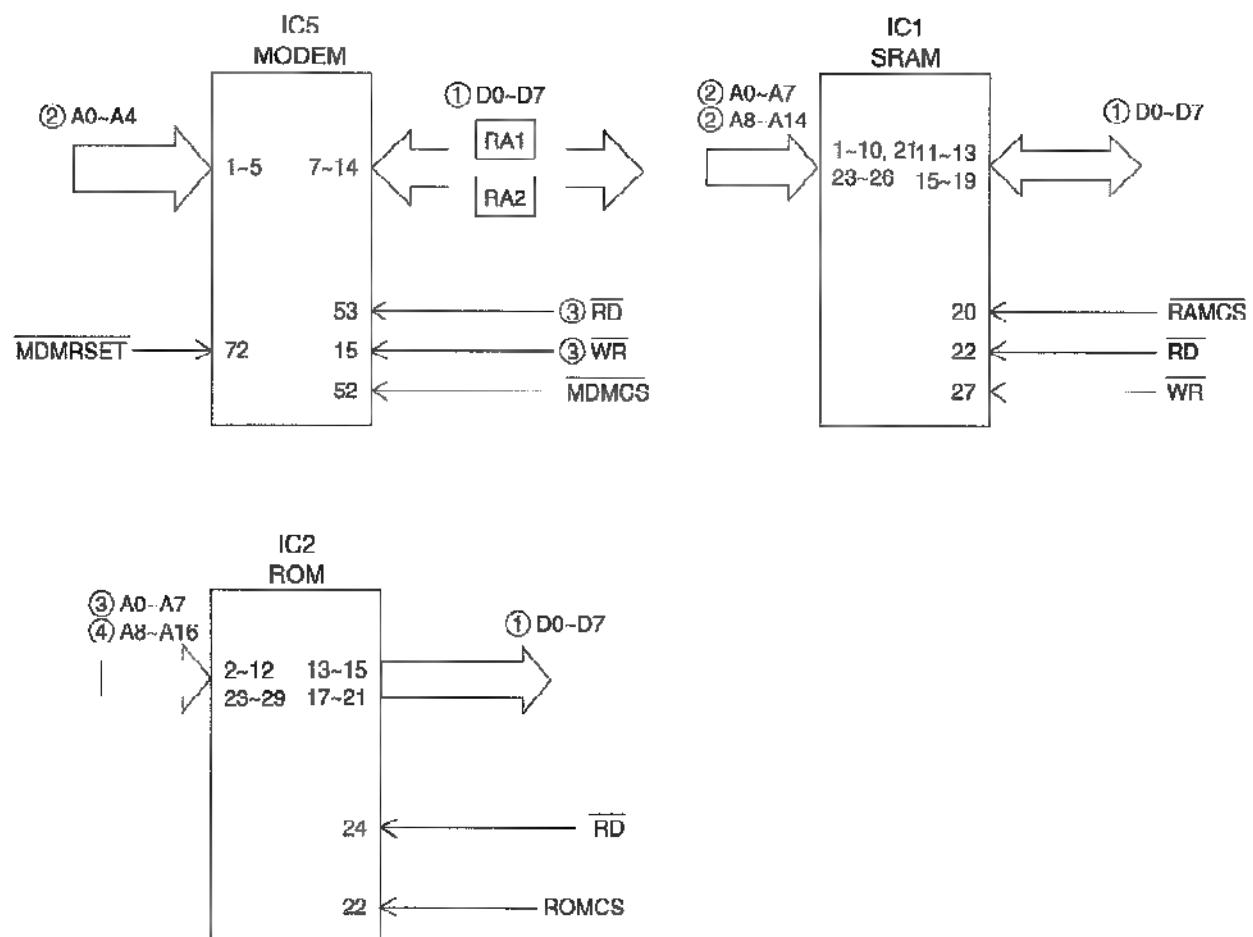
Accordingly, the problem presented here is whether each IC outputs the correct signal. (See the I/O direction diagram on the next page.) In other words, is it constantly switching between 5V (H) and 0V (L) as described earlier.

## I/O and Pin No. Diagram

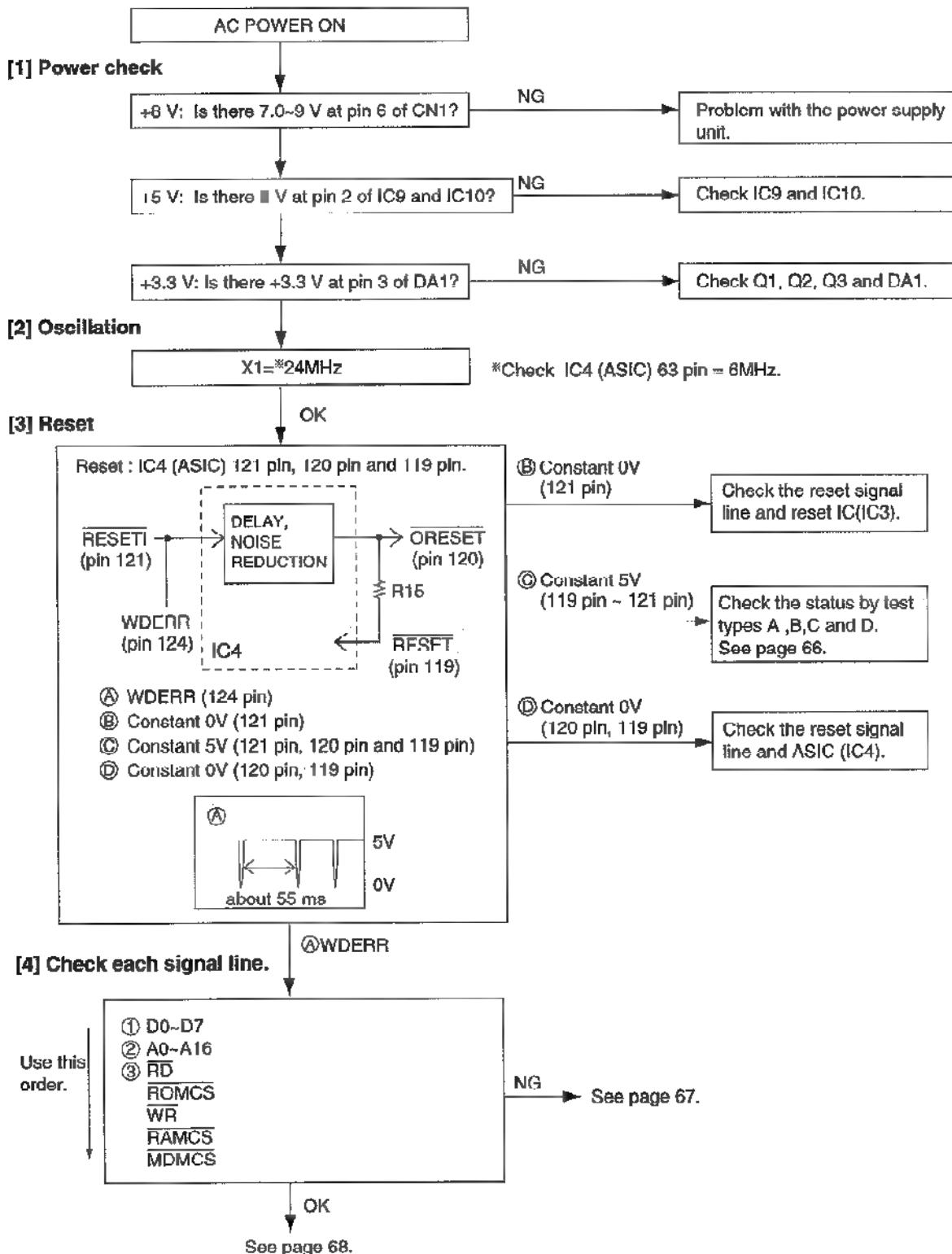
## TROUBLESHOOTING GUIDE



**KX-FT37AL**

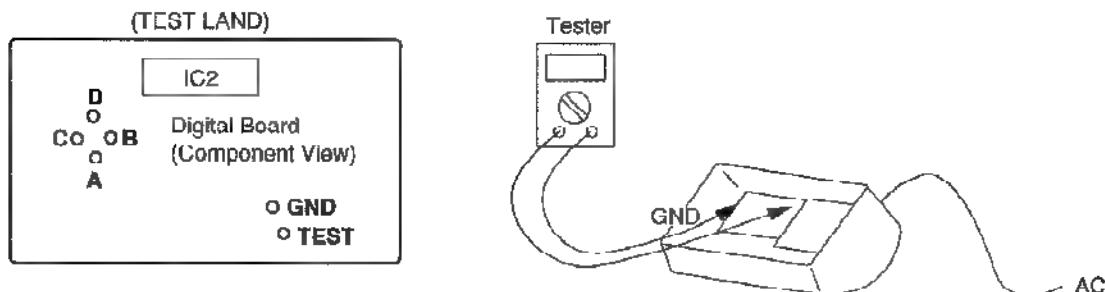


After the power is turned on, the ASIC(CPU) initializes and checks each IC. The ROM, SRAM, and Modem are checked. If initialization fails for the ICs, the system will not boot up.



## KX-FT37AL

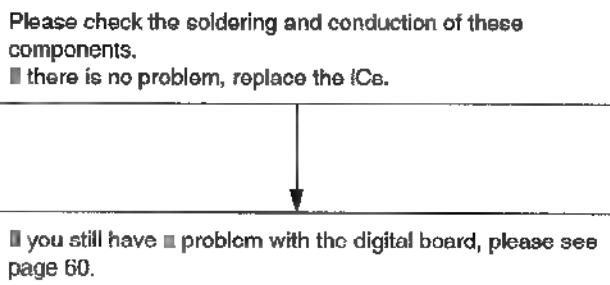
Put the unit in the test mode and check the voltage at lands A, B, C and D.



- Turn off the power supply.
- Short using a metallic object, such as tweezers, between the test and GND land, and turn on the AC power.
- Check the following voltages by using an oscilloscope or tester.
- To cancel the status check mode, turn off the AC power.

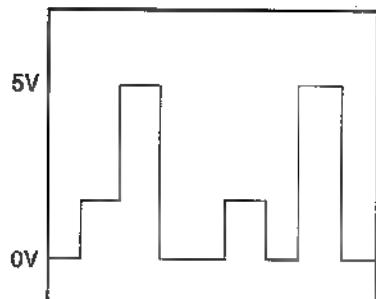
Item	Check point voltage				Check points
	A	B	C	D	
CLOCK(IC4)	5V	0V	0V	0V	IC4
MODEM(IC5)	0V	5V	0V	0V	R6, IC5 (52 pin), RA1, RA2, IC4 (53 pin), IC5
S-RAM(IC1)	0V	0V	5V	0V	IC1 (20 pin), IC4 (12 pin), IC1
ASIC(IC4)	0V	0V	0V	5V	RA3-RA7, R13, R14, R18, R19, IC4 (81-113 pins)
ALL OK	5V	5V	5V	0V	

• This indicates that the Add/Data Bus, RAM, ROM, MODEM, and ASIC are all completely connected to the CPU and that control from the CPU is possible.

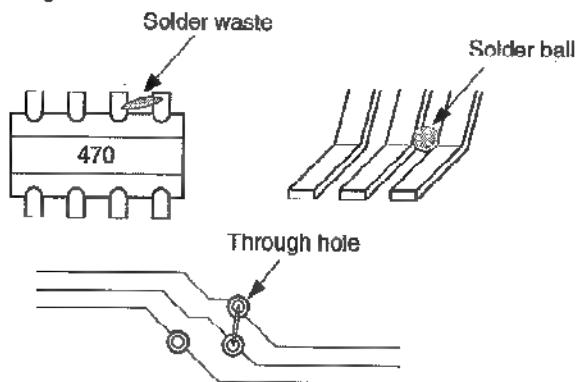


## NG Example

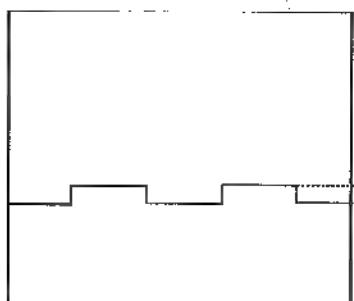
1.



Short circuit from the adjacent signal wires.  
Check for a short circuit in the RA and IC leads and the signal wire at the through hole.



2.



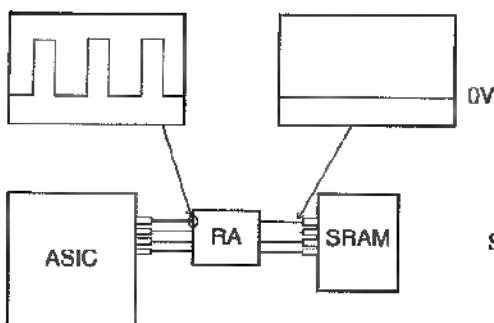
Short between the signal line and GND.

Approx. 0 or 1 V

OR IC malfunction

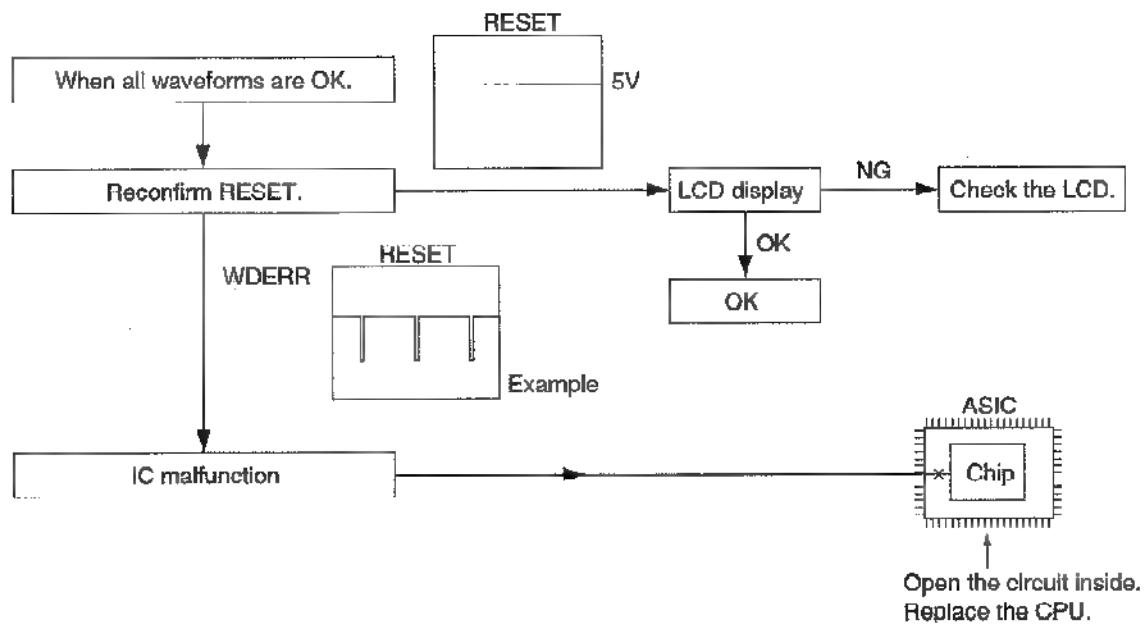


3.

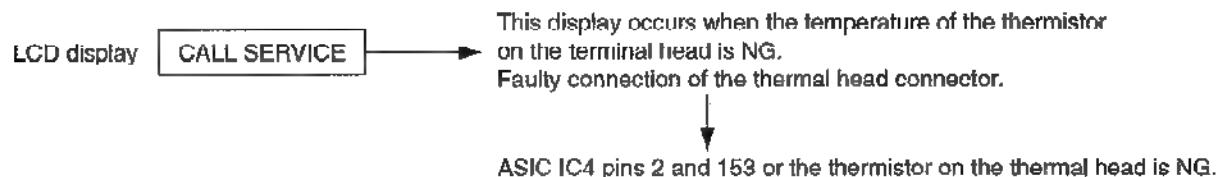


Solder fault on RA.

## KX-FT37AL

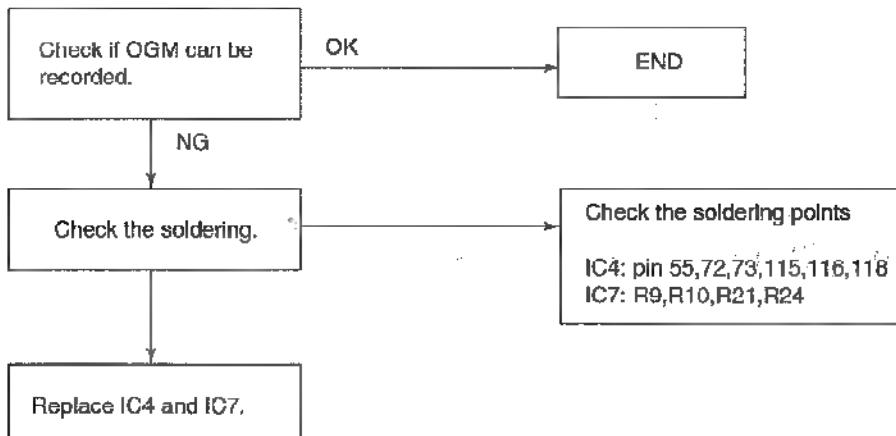


Other NG examples while the power is ON and the LCD displays the following.



## FLASH MEMORY (IC7)

If the TAM does not work, follow the procedures below.



### 3-8 Analog Board Section

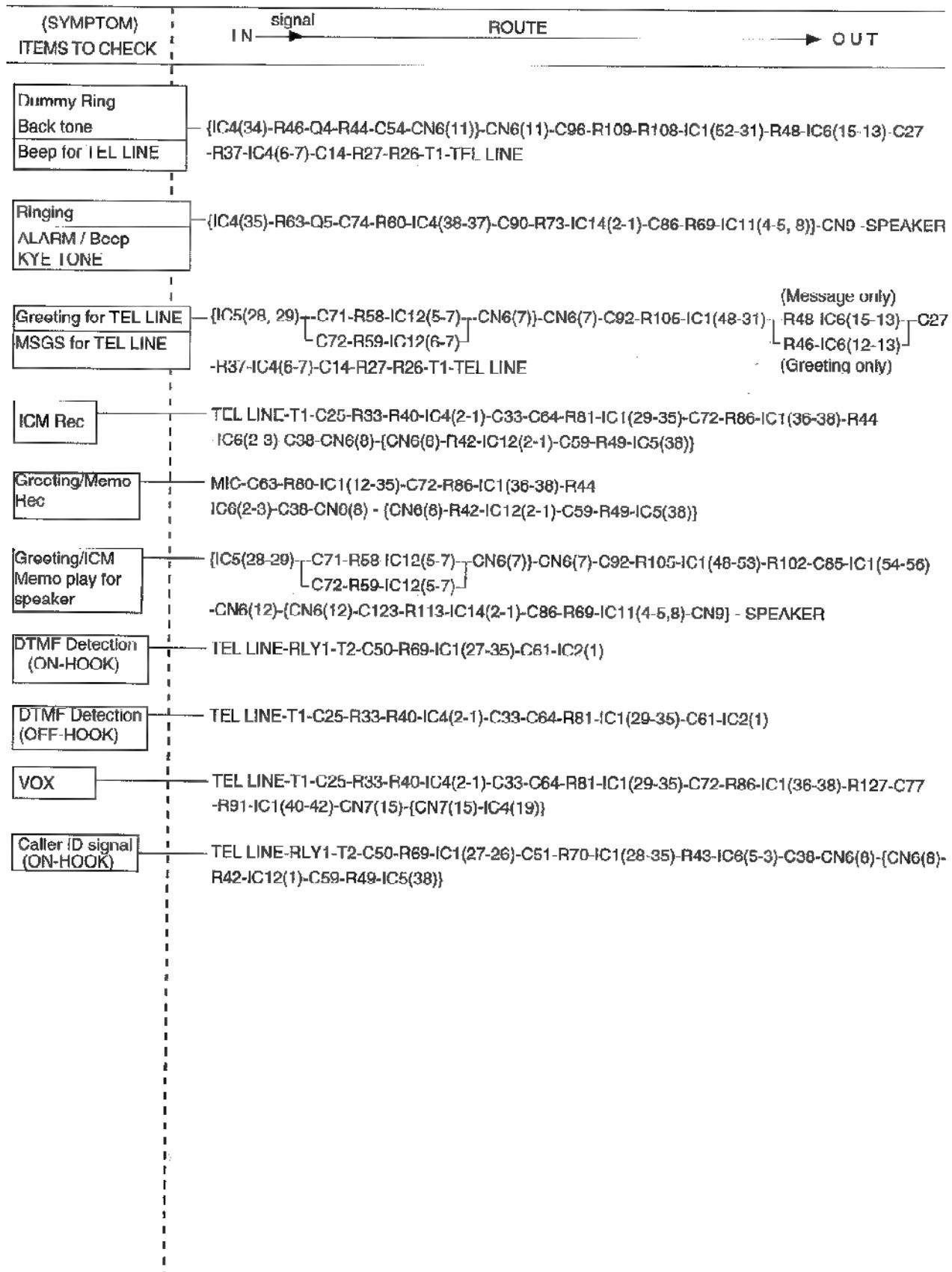
The analog parts check is actually different than the digital parts check. The signal route is determined by the purpose of the check. For example, the handset TX route begins from the handset microphone and is output in the telephone line. In this route, it is mainly an analog signal. Tracing the signal can be done easily using an oscilloscope. Each route is shown on the Check Sheet here. If there is a problem with the unit (for example, you cannot communicate with the H/S, etc.), trace the signal in the area and determine the cause.

CHECK SHEET		
(SYMPTOM) ITEMS TO CHECK	IN	ROUTE
Handset TX	signal	<p>MIC-L6-C48-R64-IC1(21)-[IC1(31)-R48-IC8(15-13)-C27-R37-IC4(6-7)-C14-R27-R26-T1-TEL LINE L9-C47-R63-IC1(22)]</p>
Handset RX		<p>TEL LINE-T1-C25-R33-R40-IC1(2-1)-C33-C64-R81-IC1(29-15, 16) -C45-L7-SPEAKER [L8]</p>
SP-PHONE TX		<p>MIC-C63-R80-IC1(12-44)-CN6(10)-(CN6(10)-C61-R54-R57-IC6(23-6)-IC5(82-28, 29) -C71-R58-IC12(5-7)-[CN6(7)] [C72-H59-IC12(6-7)] -CN6(7)-C92-R105-IC1(48-31)-H47-IC6(14-13)-C27-R37-IC4(6-7)-C14-R27-R26-T1-TEL LINE</p>
SP PHONE RX		<p>TEL LINE-T1-C25-<u>P93-P40-IC4(2-1)-C33-C64-R81-IC1(29-35)-R43-IC8(5-3)-C38-CN6(8)</u> -(CN6(8)-R42-IC12(2-1)-C59-R49-IC5(38 89) IC6(13-17, 18)-[C68-R55-IC14(5-7)-[R40-CN6(9)] [C69-R66-IC11(6-7)] -CN6(9)-C91-R104-IC1(46-53)-R102-C85-IC1(54-56)-CN6(12)-(CN6(12)-C123-R113-IC14(2-1) -C86-R69-IC11(4-5, 8)-CN9)-SPEAKER</p>
DTMF Monitor	<p>Speaker</p>	<p>{IC6(17, 18)-C68-R55-IC14(5-7)-[R48-CN6(9)]-CN6(9)-C96-H109-R108-IC1(52-53)-R102-C85 [C69-R66-IC11(6-7)] -IC1(54-56)-CN6(12)-(CN6(12)-C123-R113-IC14(2-1)-C86-R69-IC11(4-5, 8)-CN9)-SPEAKER</p>
	<p>Handset</p>	<p>{IC5(28, 29)-C71-R58-IC12(5-7)-[CN6(7)]-CN6(7)-C93-R106-IC1(49-15, 16)-[L8]-SPEAKER [C72-R59-IC12(6-7)]</p>
DTMF for TEL LINE		<p>{IC5(28, 29)-C71-R58-IC12(5-7)-[CN6(7)]-CN6(7)-C21-R36-C29-IC6(11-13)-C27-R37-IC1(6-7)-C14 [C72-R59-IC12(6-7)] -R27-R26-T1-TEL LINE</p>
CNG/DTMF Detection (while transmitting the Greeting message)		<p>TEL LINE-T1-C25-R33-R40-IC4(2-1)-C33-C34-R50-C36-IC6(1-3)-C38-CN6(8)-(CN6(8)-R42-IC12(2-1) -C59-R49-IC5(38))</p>
FAX RX		

TROUBLESHOOTING GUIDE

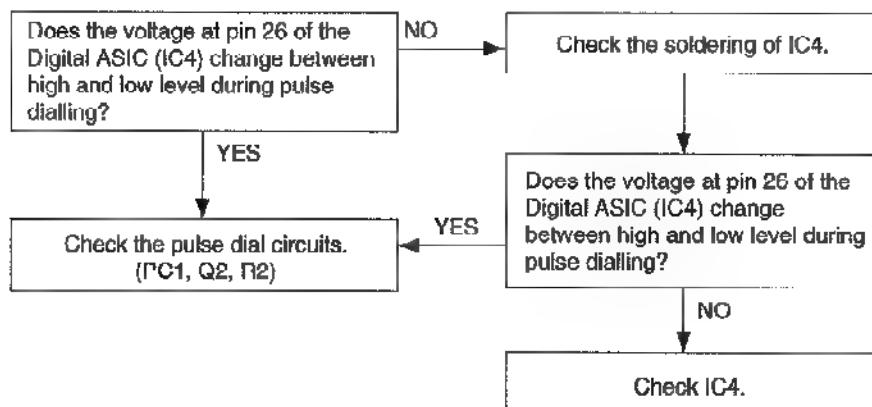
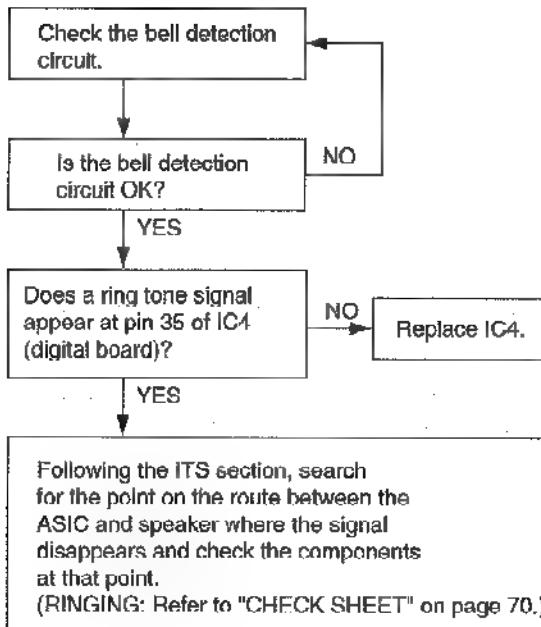
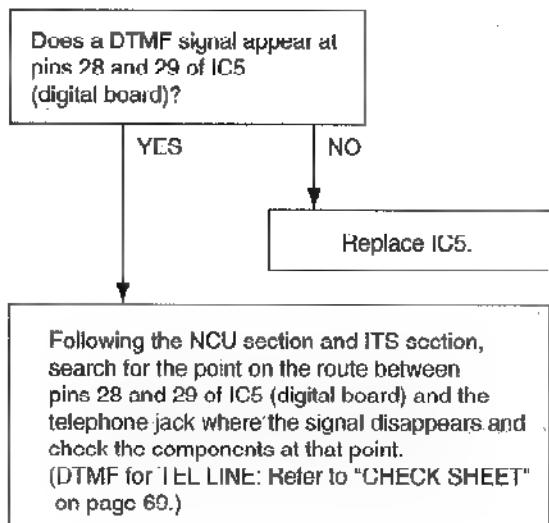
Note:  
{ } : digital board

## CHECK SHEET



**(1) Defective ITS (Integrated telephone system) section****① No handset and monitor transmission/reception**

Following the ITS section or NCU section, check the route between the microphone and the telephone line (sending) or between the telephone line and the speaker (receiving) for loss of signal. Check the components at that point.

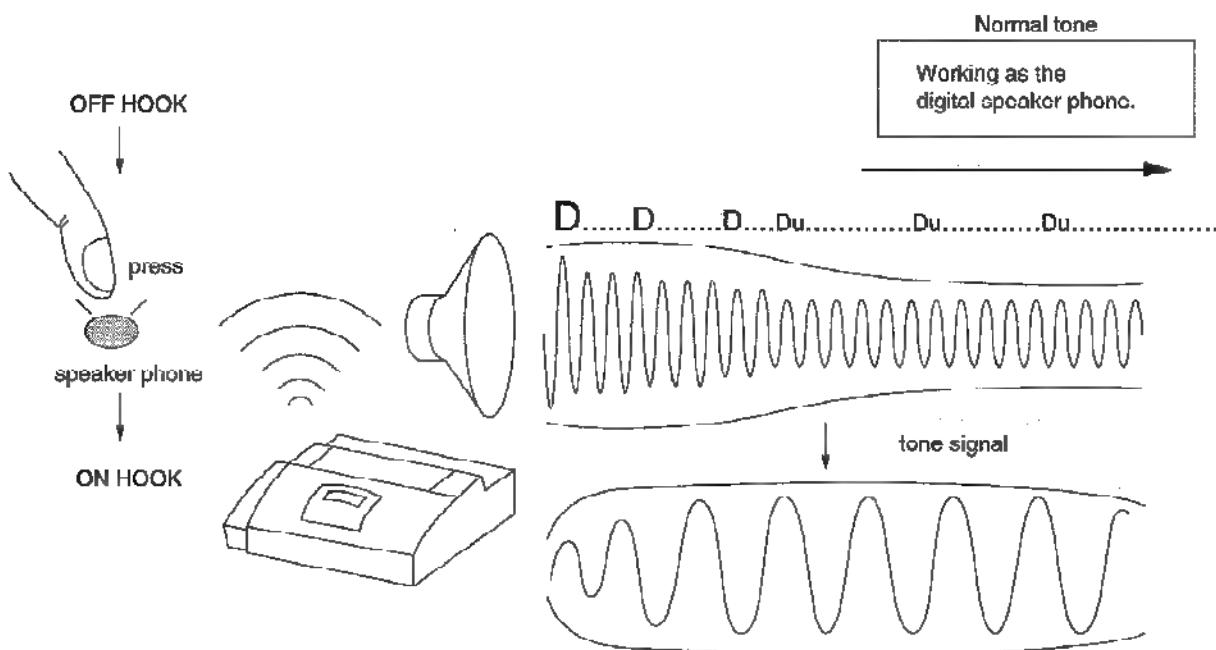
**② No pulse dialling****③ No ring tone (or No bell)****④ No tone dialling**

### 3.3.6. Digital speakerphone section

The digital speaker phone is different from the analog speaker phone.

The previous type (analog speaker phone) switches between Tx or Rx. Either Tx or Rx is able to pass through a telephone line or speaker, depending on the Tx and Rx signal (voice) level. The larger one can pass through the route for that signal. Therefore, you never hear the other party's voice while you are talking. But with the digital speaker phone feature, you can hear the other party's voice while you are talking. So both Tx and Rx are active at the same time. Troubleshooting is also different from the previous type.

At the start of communication, for the initial 2~3 exchanges the digital speakerphone performs half-duplex operation, alternating between transmission (Tx) and reception (Rx). Then duplex communication becomes possible. Learning occurs during the initial 2~3 exchanges of communication in order to set the appropriate parameters for duplex communication.

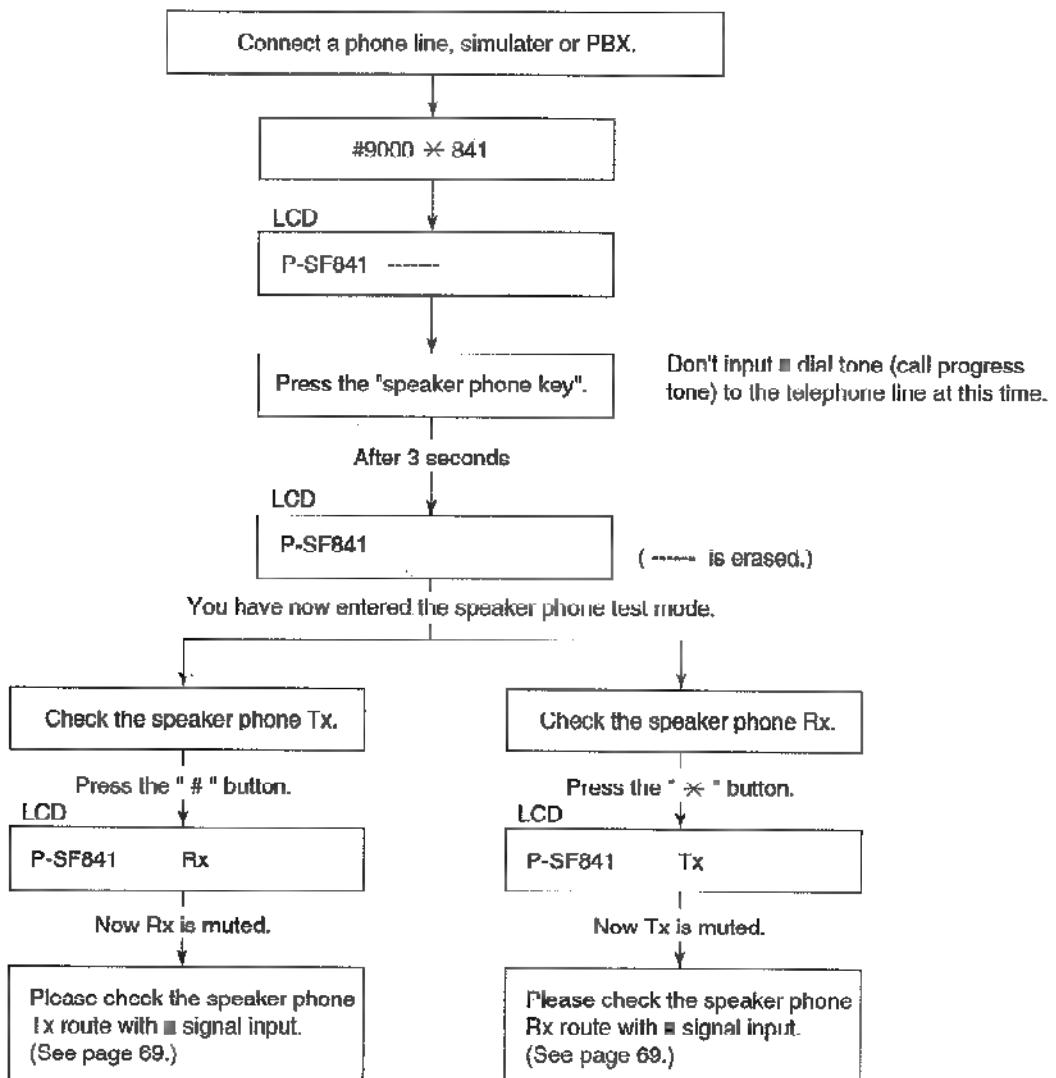


You cannot check the digital speaker phone by the previous method (signal route) because the level is changing as stated above.

Therefore, there is a service function for this troubleshooting. In this service mode, you can set the mute to either Tx or Rx. Then you can check the signal route of the speaker phone Tx or speaker phone Rx without any disturbances.

## HOW TO USE THE 841 SERVICE FUNCTION for THE DIGITAL SPEAKER PHONE

Please check by using the service function #9000 \* 841.



## KX-FT37AL

### 3-9. POWER SUPPLY SECTION

#### (1) key components for troubleshooting

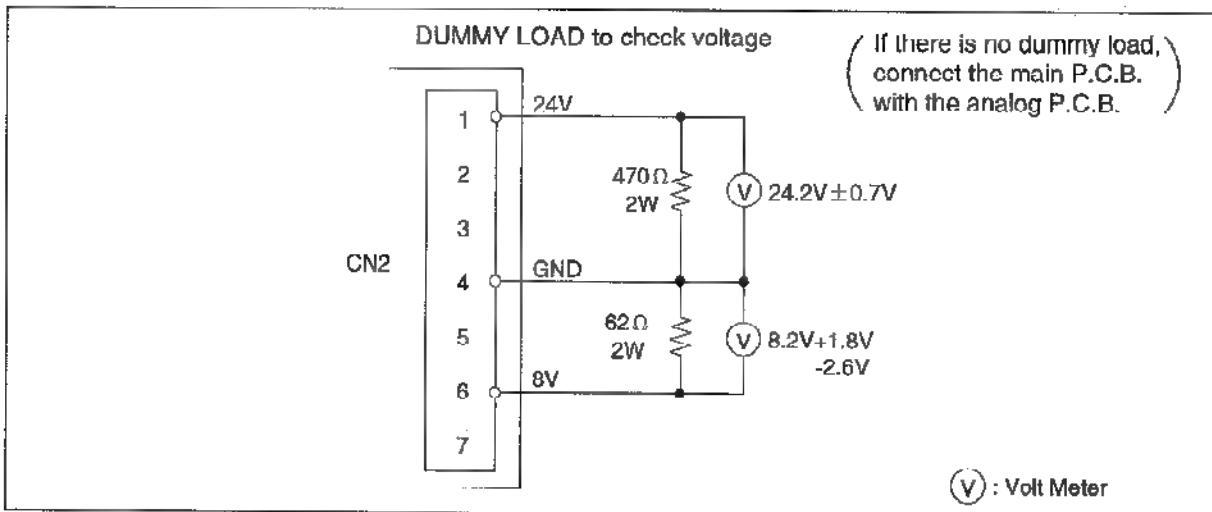
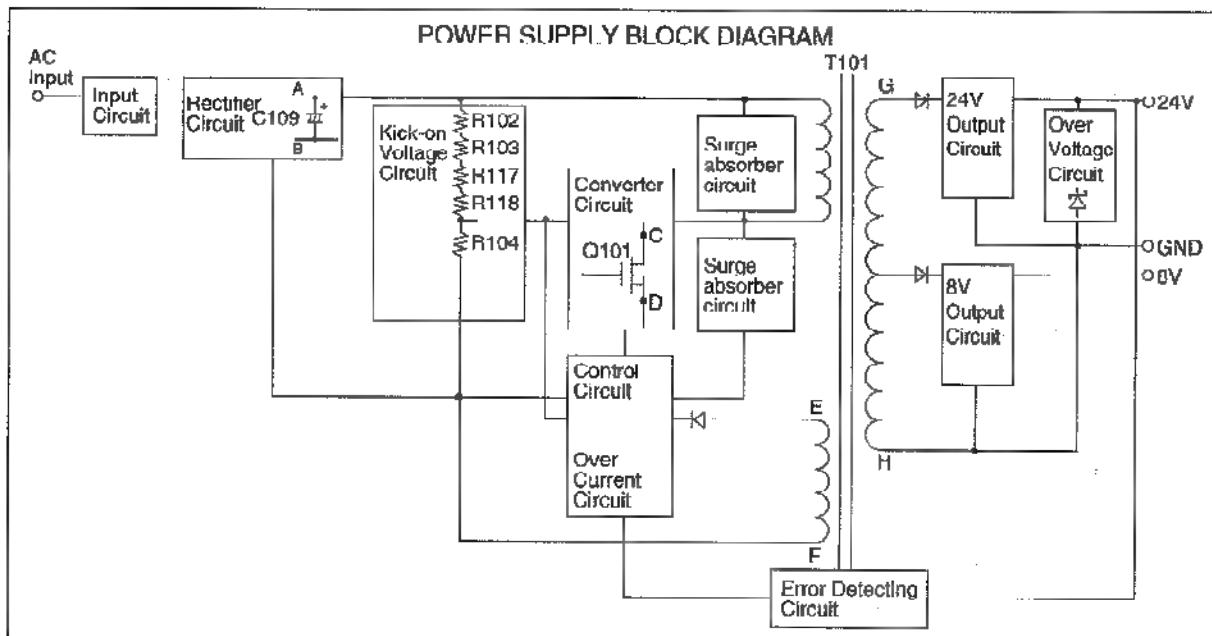
Check the following components first:

F101, D101-D104, C109, Q101, PC101, ZD203, R302.

This comes from our experience with experimental tests. For example : power supply, lightning surge voltage test, withstanding voltage test, intentional short circuit test, etc.

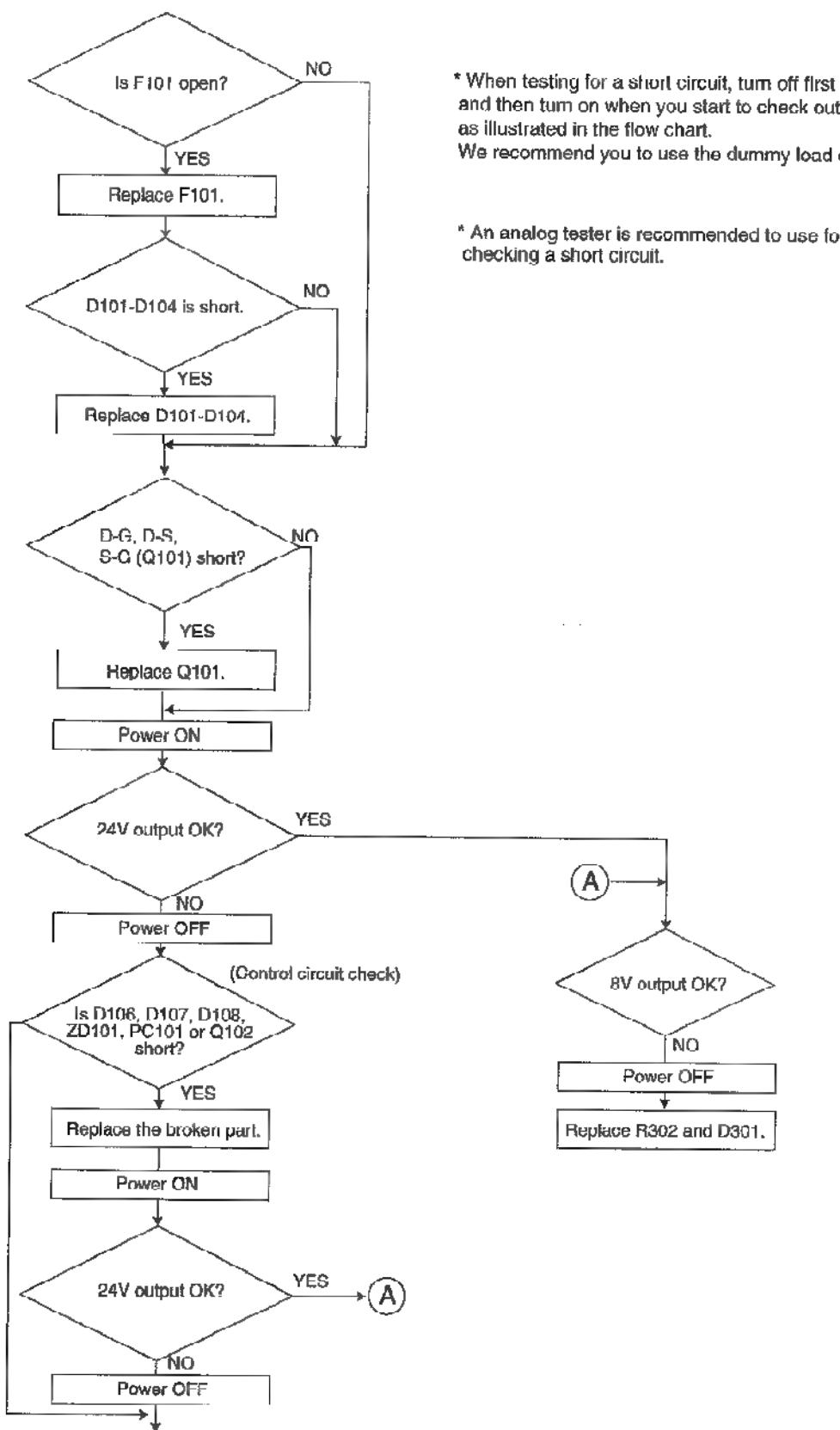
#### Caution:

A blown fuse usually indicates a faulty component. Locate and repair the fault before turning on the power. In most cases, the symptom is that nothing is output. It is more likely that the fault is in the primary side rather than the secondary side. Check the primary side components first.



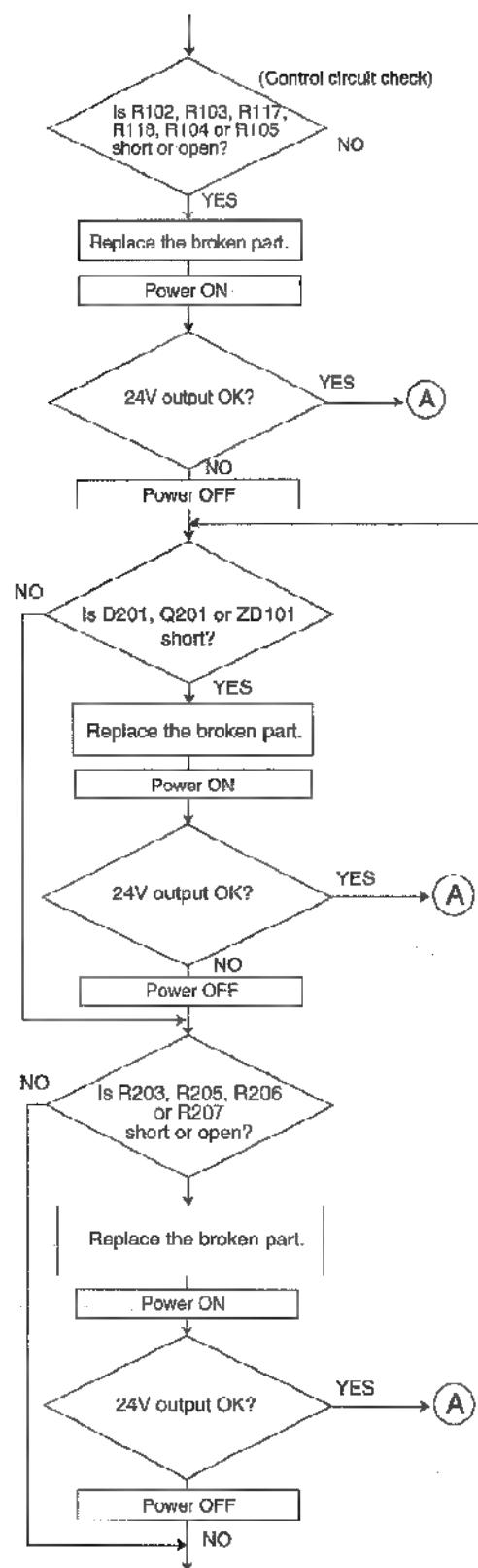
## (2) Troubleshooting flow chart

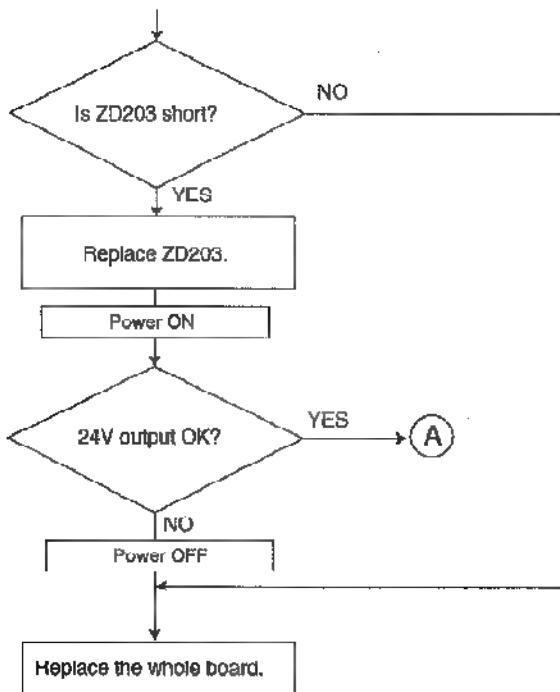
\* Before turning on the power supply, you should check F101.



\* When testing for a short circuit, turn off first and then turn on when you start to check output voltage (24V or 8V) as illustrated in the flow chart.  
We recommend you to use the dummy load on page 74.

\* An analog tester is recommended to use for checking a short circuit.





### (3) Broken parts repair details

#### (D101, D102, D103, D104)

Check for a short-circuit in terminal 4. If D101, D102, D103 and D104 are short-circuited, F101 will melt (open). In this case, replace all of the parts (D101, D102, D103, D104, F101).

#### (Q101)

The worst case of Q101 is a short-circuit between the Drain and Gate because damage expands to the peripheral circuit of Q101.

This is due to a very high voltage through the Gate circuit which is composed of R106, Q102 and D106. You should change all of the parts listed as follows.

F101, Q101, R105, Q102, D106

#### (D201)

If D201 is broken, the oscillation circuit in the power supply cannot operate. Check it with an electric tester.

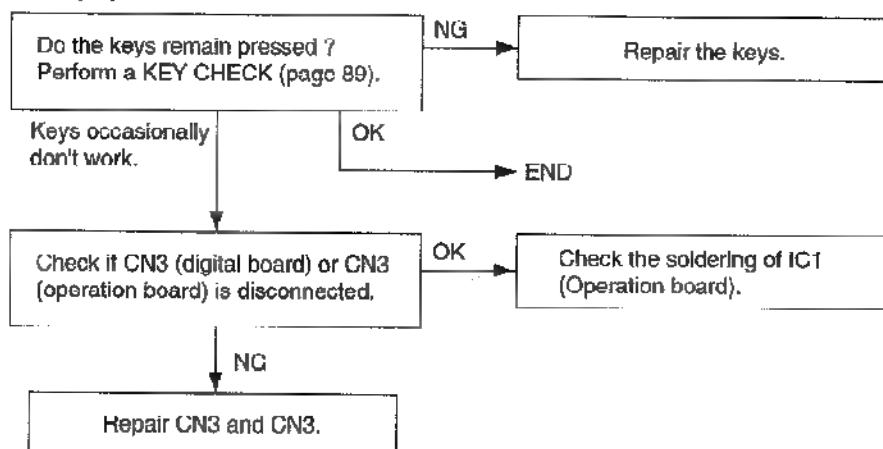
#### (ZD203)

If ZD203 shorts, the voltage feedback circuit is almost always the cause. Replace the following parts if this happens.

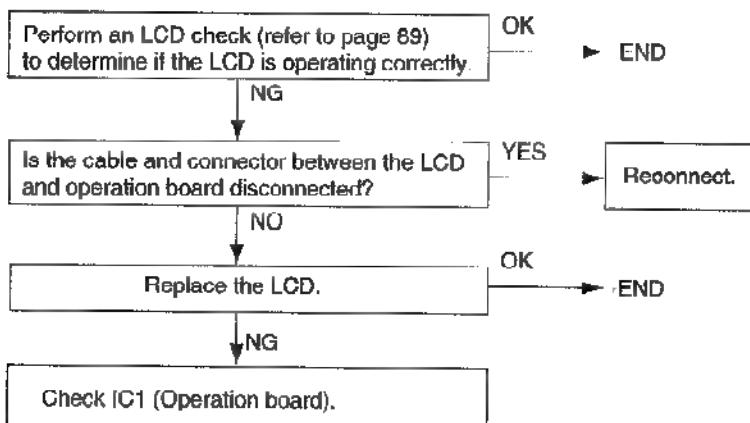
PC101, Q102, ZD201, D107, ZD101, D106

**3-10.OPERATION BOARD SECTION**

**① No key operation**



**② No LCD indication**



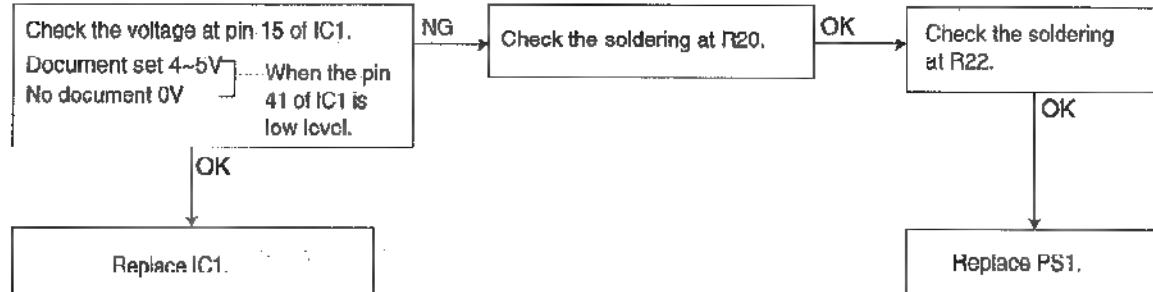
### 3-11. SENSOR SECTION (Refer to page 128 for circuit operation)

The Test Function makes the sensor circuit check easier. (see page 90.)

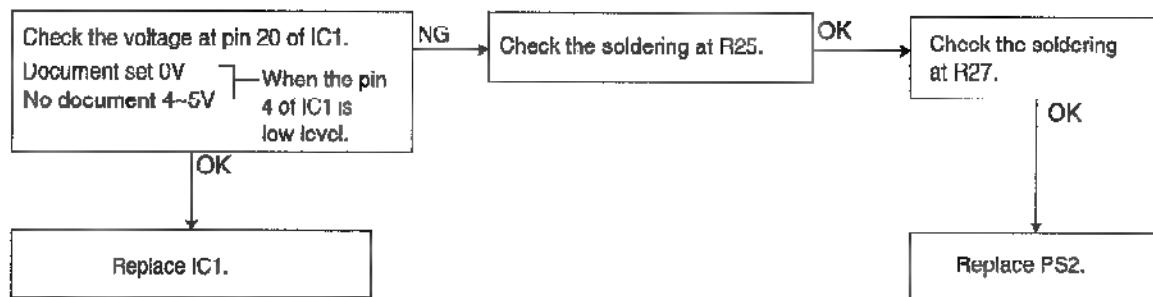
For example, as for "COVER OPEN SENSOR", "CO" is turned ON/OFF on the display when you open or close the front cover. Also, document sensor, read position sensor, recording paper sensor and jam sensor are turned ON/OFF by the copy operation. Therefore, each sensor can be checked for proper mechanical operation.

As for the electric check, check whether each voltage is right or not with following flowchart turning each sensor lever ON/OFF manually.

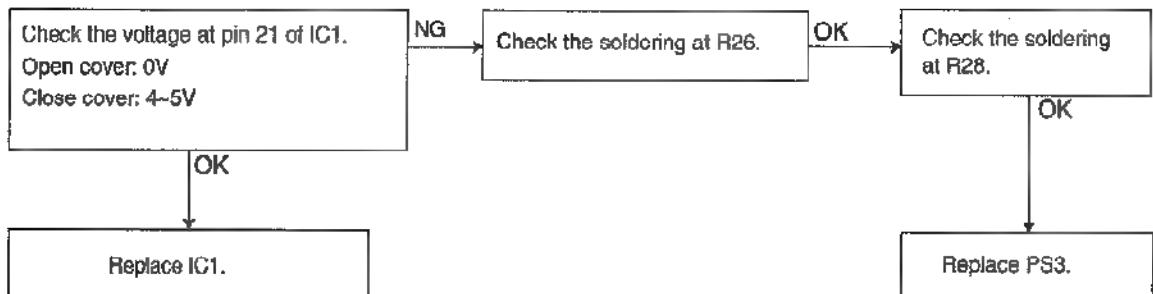
#### (1) Check the document sensor (PS1) "CHECK DOCUMENT"



#### (2) Check the read position sensor (PS2) "REMOVE DOCUMENT"

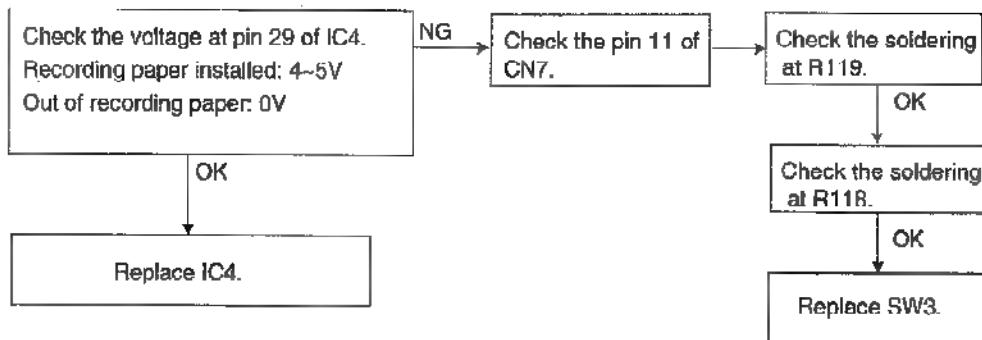


#### (3) Check the cover open sensor (PS3) "CHECK COVER"

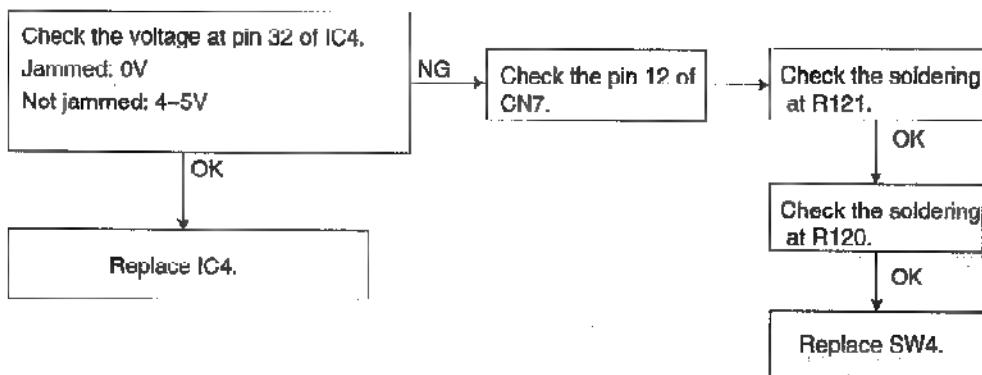


## KX-FT37AL

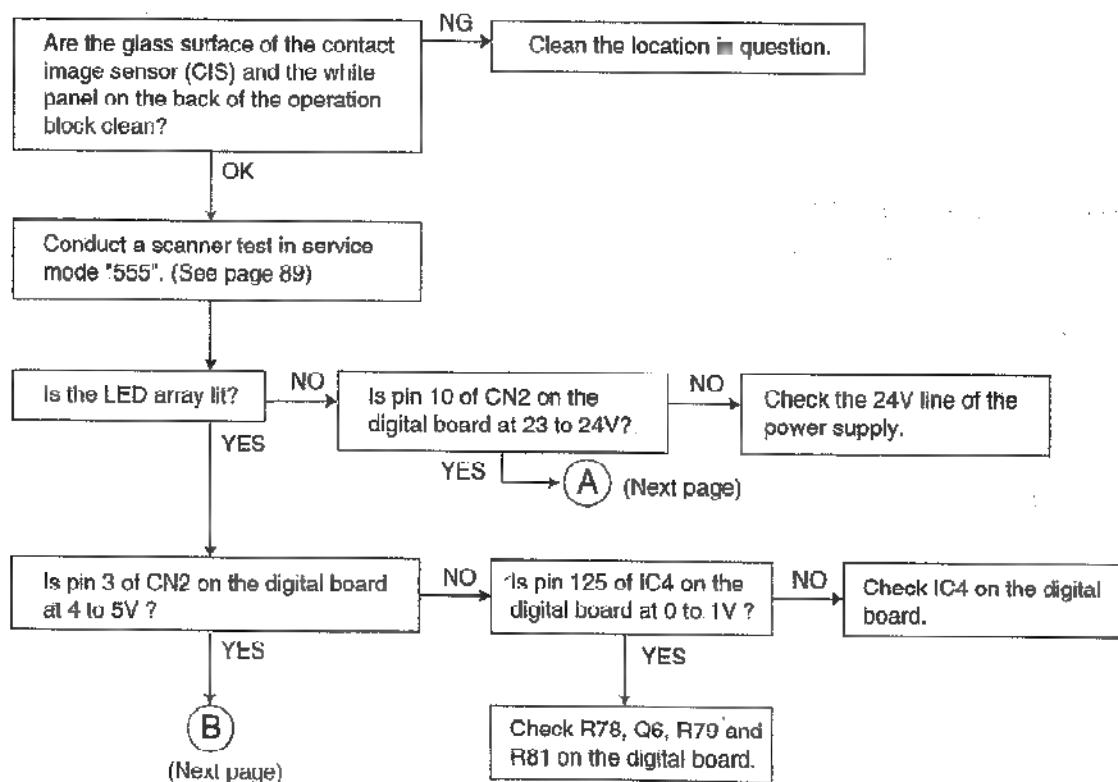
### (4) Check the recording paper sensor (SW3) "OUT OF PAPER"



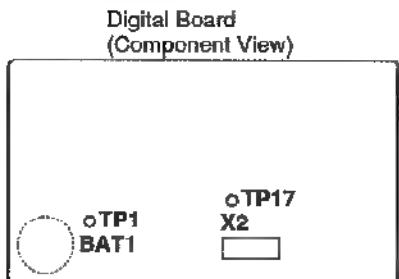
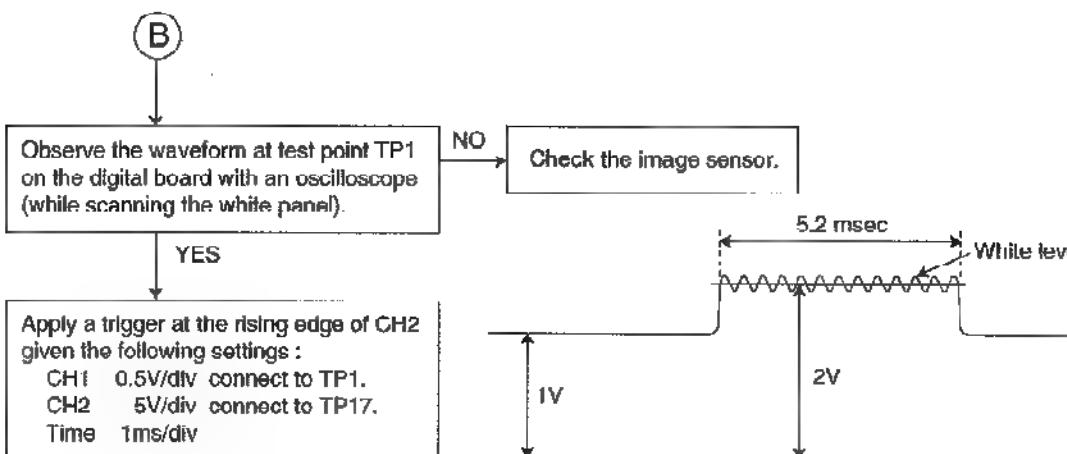
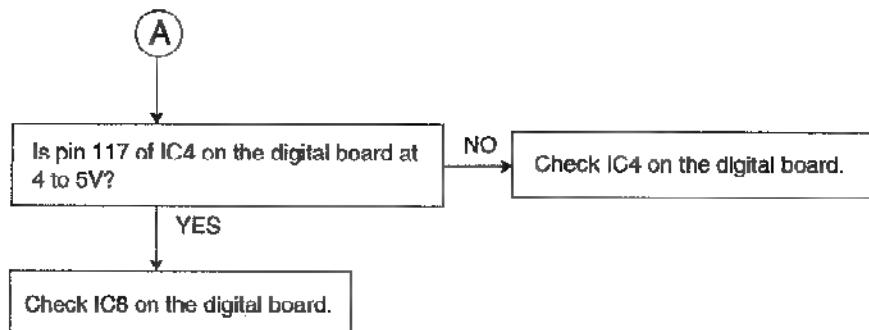
### (5) Check the jam sensor (SW4) "PAPER JAMMED"



### 3-12. READ SECTION (Refer to page 121 for circuit operation: SCANNING BLOCK)

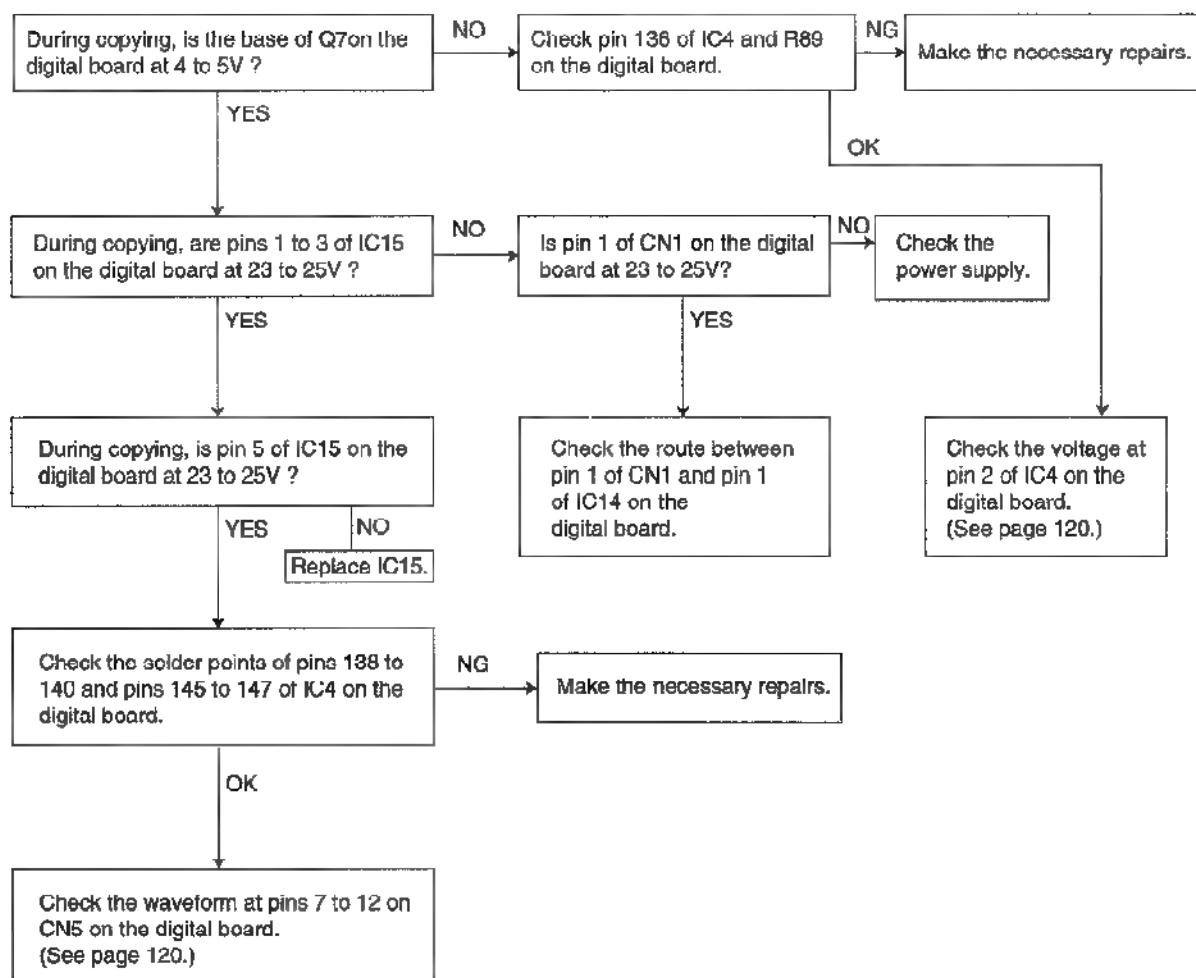


## TROUBLESHOOTING GUIDE



## KX-FT37AL

### 3-13. THERMAL HEAD SECTION (Refer to page 119 for circuit operation)



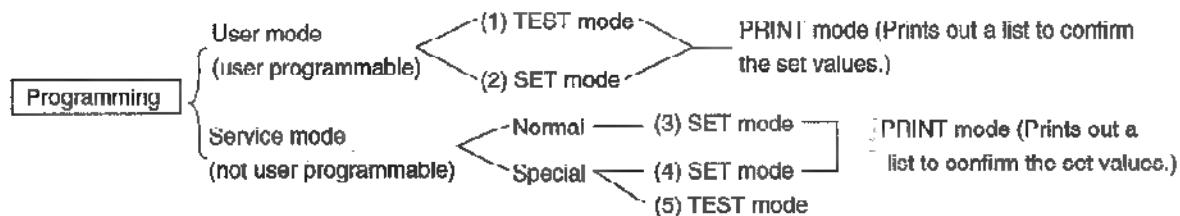
## 4. PROGRAMMING AND LISTS

The programming functions are used to program the various features and functions of the machine, and to test the machine. Programming can be done in both the on-hook and off-hook conditions. This facilitates communication between the user and the service while programming the machine.

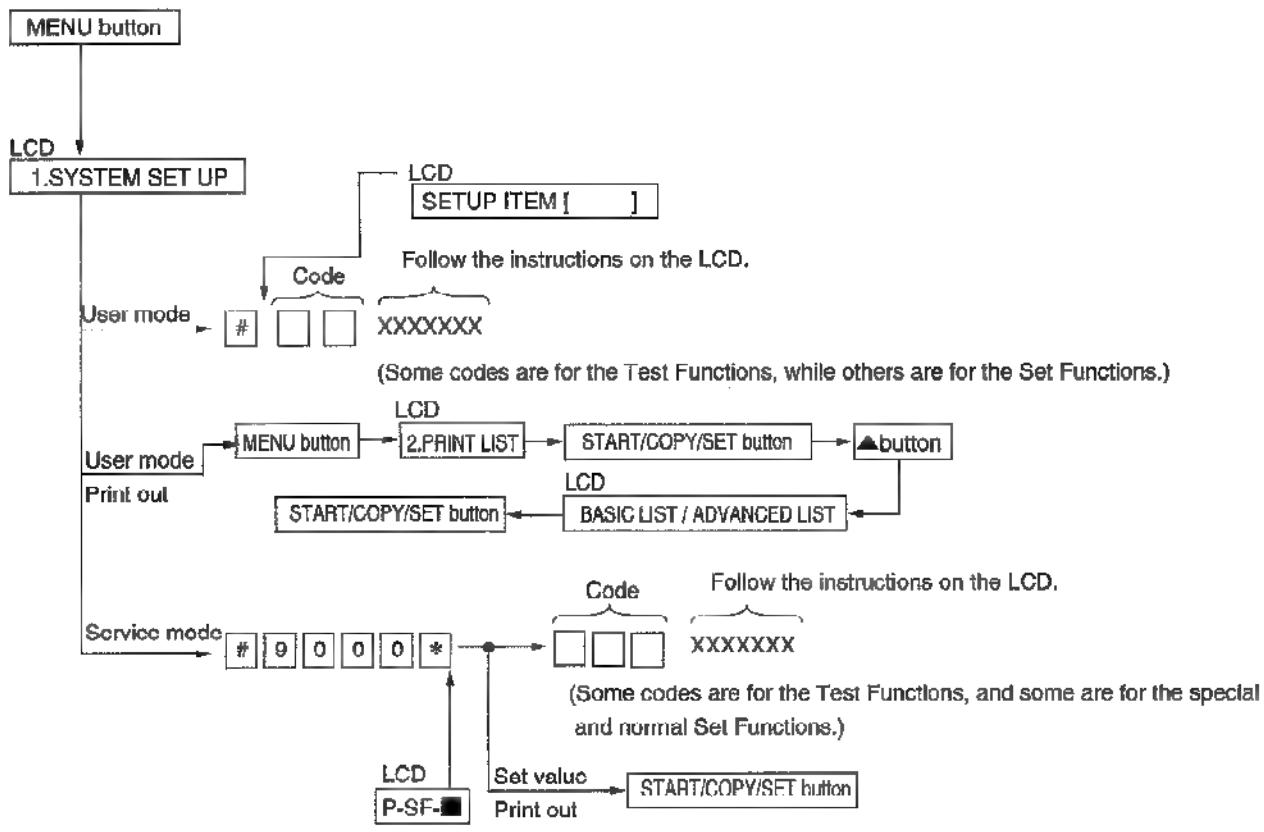
### 4-1. OPERATION

There are 2 basic categories of programming functions, the User Mode and the Service Mode. The Service Mode is further broken down into the normal and special programs. The normal programs are those listed in the Operating Instructions and are available to the user. The special programs are only those listed here and not displayed to the user. In both the User and Service Modes, there are Set Functions and Test Functions. The Set Functions are used to program various features and functions, and the Test Functions are used to test the various functions. The Set Functions are accessed by entering their code, changing the appropriate value, then pressing the SET key. The Test Functions are accessed by entering their code and pressing the key listed on the menu. While programming, to cancel any entry, press the STOP key.

### 4-2. OPERATION FLOW



#### Operating Procedure



**KX-FT37AL**

4-3. USER MODE (The list below is an example of the SYSTEM SETUP LIST the unit prints out.)  
(For Spanish)

**BASIC FEATURE LIST**

NO.	FEATURE	CURRENT SETTING	
#01	SET DATE & TIME	JAN. 01 1998 12:01AM	
#02	YOUR LOGO		
#03	YOUR TELEPHONE NUMBER		
#04	PRINT TRANSMISSION REPORT	ERROR	[ERROR,ON,OFF]
#05	AUTO RECEIVE MODE	TAD/FAX	[TAD/FAX,FAX ONLY]
#06	TAD/FAX RING COUNT	2	[2...9,TOLL SAVER,RINGER OFF]
#07	FAX RING COUNT	2	[2...9]
#08	MANUAL RECEIVE MODE	TEL	[TEL,TEL/FAX]
#09	TEL/FAX DELAYED RING	2	[2...9]
#10	RECORDING TIME	VOX	[VOX,1MIN]
Code	#11 REMOTE TAD ID	ID = 111	

Set Value

**ADVANCED FEATURE LIST**

NO.	FEATURE	CURRENT SETTING	
#22	JOURNAL AUTO PRINT	ON	[ON,OFF]
#23	OVERSEAS MODE	OFF	[ON,OFF]
#25	DELAYED SEND	OFF	[ON,OFF]
Code		DESTINATION =	
		START TIME =	12:00AM
#26	AUTO CALLER LIST	ON	[ON,OFF]
#30	SILENT FAX RECOGNITION RING	3	[3...9]
#31	RING DETECTION	OFF	[ON,OFF]
#39	LCD CONTRAST	NORMAL	[NORMAL,LIGHT,DARKER]
#41	FAX ACTIVATION CODE	ON	[ON,OFF]
		CODE =	*9
#42	MESSAGE ALERT	OFF	[ON,OFF]
#43	REC. TIME ALERT	OFF	[ON,OFF]
#46	FRIENDLY RECEPTION	ON	[ON,OFF]
#47	FAX VOICE GUIDANCE	ON	[ERROR,ON,OFF]
#54	GREETING MSG. RECORDING TIME	16s	[16s,60s]
NOTE :	If you change from 60sec,16sec. your greeting will be erased and your new greeting will be limited to 16 seconds.		
#58	ORIGINAL SETTING	NORMAL	[NORMAL,LIGHT,DARKER]
#60	MESSAGE TRANSFER	OFF	[MESSAGE,PAGER,OFF]
#61	TRANSFER GREETING	CHECK	[CHECK,RECORD,ERASE]
#67	ICM MONITOR	ON	[ON,OFF]
#70	FAX PAGER	OFF	[ON,OFF]
		DESTINATION =	
#76	CONNECTING TONE	ON	[ON,OFF]
#80	SET DEFAULT		

Set Value

**Note:**

The above values are the default values.

## 4-4. SERVICE FUNCTION TABLE

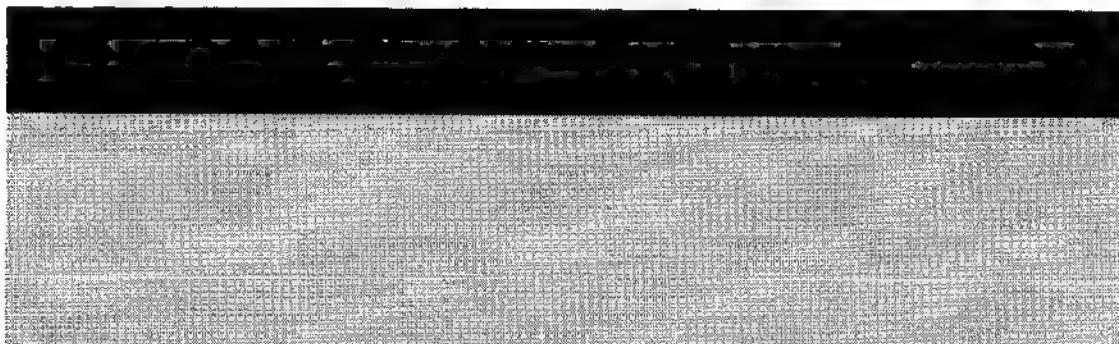
Code	Function	Set Value	Effective Range	Default	Remarks
501	Setting the pause time	001~600 X 100 msec	001~600	03000 msec	Selects the pause time in 100 msec steps.
502	Setting the flash recall time	01~99 X 10 msec	01~99	100 msec	Selects the line break time during flashing in 10 msec steps.
503	Setting the pulse dial speed	1:10pps 2:20pps	1, 2	10 pps	Sets the pulse dial speed.
510	VOX time	1:6 sec 2:4 sec	1, 2	6 sec	Setting of the end of call confirmation time by VOX.
511	VOX sense	1: HIGH 2: LOW	1, 2	HIGH	When the TAM does not stop recording the ICM because noise is detected on the telephone line, change this setting to "LOW".
512	VOX mode	1: A 2: B	1, 2	A	When the TAM recording stops according to the ending tone (periodic tone), change the setting to "B".
520	Setting the CED frequency	1:2100Hz 2:1100Hz	1, 2	2100 Hz	When international communications cannot be performed smoothly select 1100Hz. However some exchange system should not be accepted (1100Hz on CED).
521	Setting the international line mode	1:ON 2:OFF	1, 2	ON	Selects the international line mode during FAX communication. (See page 43)
522	Setting the return to default mode	1:ON 2:OFF	1, 2	ON	Set the resolution and contrast conditions for FAX or copy to the default settings.
523	Receive equalizer select	1:0km 2:1.8km 3:3.6km 4:7.2km	1~4	0km	When the telephone station is far from the unit or reception cannot be performed correctly, adjust accordingly.
524	Transmission equalizer select	1:0km 2:1.8km 3:3.6km 4:7.2km	1~4	1.8km	When the telephone station is far from the unit or reception cannot be performed correctly, adjust accordingly.
533	Setting the number of times that message transfer is redialed	00~99	00~99	2 times	Selects the number of times that message transfer is redialed (not including the first dialing).
534	Setting the message transfer/paper call redial interval	001~999 sec	001~999	065 sec	Sets the interval of message transfer/paper call redial.
544	Selecting the document feed position	01~99 step	00~99	--	When the ADF function is incorrect, adjust the feed position. (0 step = 1mm)
550	Memory clear				Press "START/COPY/SET".
551	ROM version and sum check				Press "START/COPY/SET".
553	Setting the FAX monitor function	1: OFF 2: PHASE B 3: ALL	1, 2, 3	OFF	Sets whether to monitor the line signal with the unit's speaker during FAX communication or not.
554	Modem test				Press "START".
555	Scanner test				Press "START".
556	Motor test				Press "START".
557	LED test				Press "START".
558	LCD test				Press "START".

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Code	Function	Set Value	Effective Range	Default	Remarks
559	Setting the document jam detection	1:ON 2:OFF	1, 2	ON	Selects the jam detection of a document during FAX transmission/copying.
560	Cutter selection	1:ON 2:OFF	1, 2	ON	Turns OFF the cutter function.
561	KEY test				Press any key.
562	Cutter test				Press "START" key. [Refer to Test function]
563	CCD position adjustment value set	00~30 X 1 mm	00~30	----	Lets you select the correction value for the scanner to align the image.
570	Setting the % break	1:61% 2:67%	1, 2	67%	Sets the % break of pulse dialing.
571	Setting the number of times that ITS is redialed	00~99	00~99	00 times	Selects the number of times that ITS is redialed (not including the first dial).
572	Setting the ITS redial Interval	001~999 sec	001~999	065 sec	Sets the interval of ITS redialing.
573	Setting of number of rings for REMOTE TURN ON	01~99	01~99	15 times	Sets the number of rings before the unit starts to receive a document in the TEL mode.
580	TAM continuous tone detection	1:ON 2:OFF	1, 2	ON	ON: Stops TAM operation when Dial tone, etc. are detected.
580	Setting the number of FAX redial times	00~99	00~99	2 times	Selects the number of redial times during FAX communication (not including the first dial).
591	Setting the FAX redial interval	001~999 sec	001~999	065 sec	Sets the FAX redial interval during FAX communication.
592	Designation of CNG sending	1: OFF 2: ALL 3: AUTO	1, 2, 3	ALL	Lets you select the CNG output during FAX transmission. ALL: CNG is output at phase A. AUTO: CNG is output only when automatic dialing is performed. OFF: CNG is not output at phase A.
593	Setting the Interval between CED and the 300 bps signal	1: 75 msec 2:500 msec 3:1000 msec	1, 2, 3	75 msec	Sets the interval between the CED signal and subsequent 300 bps signal. (See page 43)
594	Setting the overseas DIS detection	1: Detects on the 1st time. 2: Detects on the 2nd time.	1, 2	Detects on the 1st time.	Sets the recognition format of the DIS signal. 1: Detects the first DIS signal sent from the receiver during FAX transmission. 2: Ignores the first DIS signal sent from the receiver during FAX transmission. (See page 43)
595	Setting an acceptable reception error value	001~999 X number of times	001~999	100	Sets the number of acceptable error lines when the FAX reconstructs the received data.
596	Setting the transmit level	-15~00	-15~00	-10 dBm	Selects the FAX transmission level.
598	Receiving Sensitivity	-43dBm	20~48	43	See page 43.

Code	Function	Set Value	Effective Range	Default	Remarks
717	Transmit speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX transmission.
718	Receive speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX reception.
719	Ringer off in TEL/FAX mode	1:ON 2:OFF	1, 2	ON	Sets the ringer switch off when a call is received in the TEL/FAX mode.
721	Pause tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection for pauses in dialing.
722	Redial tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection mode after redialing.
731	CPC mode	1:A 2:B 3:OFF	1, 2, 3	A	Set the CPC signal detection mode from the converter.
732	AUTO disconnect	1:350 ms 2:1.6 sec 3:OFF	1, 2, 3	350 ms	Selects the start time detection of auto disconnect.
763	CNG detect time	1:10 sec 2:20 sec 3:30 sec	1, 2, 3	20 sec	Selects the CNG detection time of friendly reception.
771	T1 timer	1:35 sec 2:60 sec	1, 2	35 sec	Sets a higher value when the response from the other party needs more time during FAX transmission.
775	Monitoring of message transfer	1:ON 2:OFF	1, 2	2	If set to ON a message can be monitored from this unit's SP-PI IONE when transferring a message.
784	Voice prompt test				You can hear the voice prompt from speaker after pressing "START" key.
815	Sensor check				Press "START".
844	Original setting	1:NORMAL 2:LIGHT 3:DARKER	1, 2, 3	NORMAL	Use this feature when you need to transmit and copy a document with very faint writing or very dark writing.
890	TEL/FAX ring back tone	1:ON 2:OFF	1, 2	1	Selects whether the TEL/FAX 1st ring back tone is ON or OFF in the TEL/FAX mode.

Printer test list (#86)



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#### 4-5. SERVICE MODE SETTING VALUES (Example of a printed out list)

**SERVICE DATA LIST**

Code	Set Value
501 PAUSE TIME	= 030*100ms [001...600]*100ms
502 RECALL TIME	= 10*10ms [01...99]*10ms
503 DIAL SPEED	= 10pps [1=10 2=20]pps
510 VOX TIME	= 6sec [1=6 2=4]sec
511 VOX SENSE	= HIGH [1=HIGH 2=LOW]
512 VOX MODE	= A [1=A 2=B]
520 CED FREQ.	= 2100Hz [1=2100 2=1100]Hz
521 INTL. MODE	= ON [1=ON 2=OFF]
522 AUTO STANDBY	= ON [1=ON 2=OFF]
523 ROV BOL.	= 0.0KM [1=0.0 2=1.8 3=3.6 4=7.2]KM
524 SND FNL	= 1.8KM [1=0.0 2=1.8 3=3.6 4=7.2]KM

## SPECIAL SERVICE SETTING

Code	533 82	534 865	544 50	553 1	559 1	560 1	563 15	570 2	571 00	572 065	573 15	580 1	590 02
Set Value													
	591 065	592 2	593 1	594 1	595 100	596 11	598 43	717 1	718 1	719 1	721 1	722 1	731 1
	732 1	763 3	771 1	775 2	844 1								
Note:										The above values are the default values.			

**Note:** The above values are the default values.

## **HISTORY 1**

1. DATE

SEP. 29 1998 12:01AM  
TIME 000000 HOURS

TIME=000000 AD

KEY OPER

### LAST 50:

3. NUMBER OF COPY  
SPACES

6.1.10.10

4. NUMBER OF RX

5. NUMBER OF TX

= 

YOUR LOGO

YOUR TELEPHONE NUMBER

#### 4.6 OTHER

## [HISTORY]

No.	Display	Function
1	DATE	Date and time which are set by a user for the first time after purchase. TIME is the expiration from the first power on after purchase.
2	KEY OPERATION	Indicate 2-digit codes. 1st.50: History of the key operation from 1st to 50th after purchase. Last.50: History of the last 50 key operations.
3	NUMBER of COPY	The number of pages copied.
4	NUMBER of RX	The number of pages received.
5	NUMBER of TX	The number of pages sent.

## 5. TEST FUNCTIONS

The codes listed below can be used to perform simple checks of some of the unit's functions. When complaints are received from customers, they provide an effective tool for identifying the locations and causes of malfunctions.

Test mode	Type of Mode	● Code <input type="text"/> <input type="text"/> ● Operation after code input.	Function
PRINT TEST	User mode	8 <input type="text"/> 6	Prints a test pattern and checks the thermal head for abnormalities (missing dots, etc.), and also checks the operation of the reception motor. (Printer test list: page 87)
		START	
MOTOR TEST	Service Mode	5 <input type="text"/> 6	Rotates the transmission and reception motors to check the operation of the motors. 11.....Forward TX motor--- TX/Document feed 12.....Forward RX and TX motor--- Copying 13.....Forward RX motor--- RX/Print out 14.....Backward RX motor---Cutter/Pull back recording paper ● Press the STOP button to cancel.
		START	
MODEM TEST	Service Mode	5 <input type="text"/> 4	First, go OFF-HOOK with the handset to enter this Test Mode. Each time you press the start key, each of the signals will be heard in the following order from the handset. 1) OFF → 2) 9600bps → 3) 7200bps → 4) 4800bps → 5) 2400bps → 6) 300bps → 7) 2100Hz → 8) 1100Hz
		START	
ROM CHECK	Service Mode	5 <input type="text"/> 1	Indicates the version and checks the sum of the ROM.
		START	
SCAN CHECK	Service Mode	5 <input type="text"/> 6	Turns on the LEDs of the CIS unit and operates the read system.
		START	
LCD CHECK	Service Mode	5 <input type="text"/> 0	Checks the LCD indication. Illuminates all the dots to check if they are normal.
		START	
DTMF SINGLE TEST	Service Mode	5 <input type="text"/> 2	Outputs DTMF as single tones. Used to check the frequencies of the individual DTMF tones. Refer to "5.1 DTMF Single Tone Transmit Select" on page 90.
		1..On 2..Off	
LED TEST	Service Mode	5 <input type="text"/> 7	All LEDs flash on and off, or are illuminated.
		START	
KEY CHECK	Service Mode	5 <input type="text"/> 1	Checks the button operation. Indicates the button code on the LCD while the button is pressed. Refer to "5.2 Button Code Table" on page 90.
		START { any key }	
FACTORY SET	Service Mode	5 <input type="text"/> 0	Clears the memory where the users can store data.
		START	
CUTTER TEST	Service Mode	5 <input type="text"/> 2	Check the cutter operation.
		START	

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SENSOR CHECK	Service Mode	8 1 5	CHECKS THE SENSOR OPERATION
		START	After entering this mode, perform the copy operation. For each sensor's operation, refer to page 128.

### LCD DISPLAY

Do Sn Co Ja Pa Vx

Do: Document Sensor:

Turns on when a document is inserted.

Sn: Read Position Sensor:

At the read position with the cover opened, the sensor lever is pressed directly.

Co: Cover open sensor:

Turns on and off when the front cover is opened and closed.

Ja: Jam Sensor:

Turns off when the front cover is opened and on the sensor lever is pressed directly.

Pa: Recording Paper Sensor: Turns on and off when the cassette lock lever is pushed down and up.

Vx: Vox signal: Detection signal for the tone on the line.

If there is a tone, it is ON.

**Note:** The numbers in the boxes (XXX) indicate the keys to be input for the various test modes.

## 5.1 DTMF SIGNAL TONE TRANSMIT SELECTION

When set to ON (=1), the 12 keys and transmission frequencies are as shown.

key	High Frequency (Hz)	Key	Low Frequency (Hz)
"1"	697	"5"	1209
"2"	770	"6"	1336
"3"	852	"7"	1477
"4"	941	"8"	1633

When set to OFF (=2), the 12 keys and transmission frequencies are as shown.

High (Hz)	1209	1336	1477
Low (Hz)			
697	"1"	"2"	"3"
770	"4"	"5"	"6"
852	"7"	"8"	"9"
941	*	"0"	"#"

**Note:** After performing this check, do not forget to turn the setting off.

Otherwise, dialing using DTMF will not be possible.

## 5-2. BUTTON CODE TABLE

Code	Button Name	Code	Button Name	Code	Button Name	Code	Button Name
02	RESOLUTION	0E	▼ VOLUME	35	5	9E	RECALL
03	AUTO RECEIVE			36	6	20	SEARCH DIAL
04	START/COPY/SET	14	RECORD	37	7		(turn to the right)
05	MENU	16	ERASE	38	*	21	SEARCH DIAL
07	HELP	18	PLAY MESSAGE	39	8		(turn to the left)
08	MONITOR	31	1	3A	9		
0A	MUTE	32	2	3B	0	00	NO INPUT
0C	DIRECTORY EDIT	33	3	3C	#	01	STOP
0D	^ VOLUME	34	4	3D	REDIAL/PAUSE		

**Note:** These codes (00,01) are only for the data in the History Report.

## ADJUSTMENTS

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ADJUSTMENTS

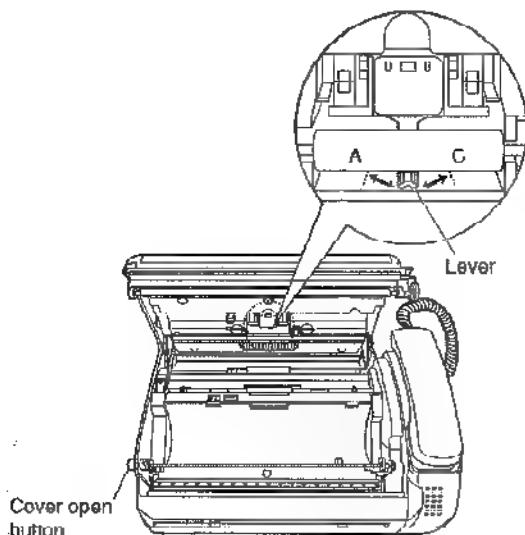
## KX-FT37AL

### 1. TABLE OF TEST EQUIPMENT AND TOOLS

No.	Test Equipment and Jig Name	Jig No.
1	Spring Height Tool	PFZZFT31BX

### 2 ADJUSTING THE FEEDER PRESSURE

If misfeeding of a document, such as multiple feeding or no feeding occurs frequently, adjust the feeder pressure by following the steps below.



- (1) Open the front lid by pressing the front lid open.
- (2) Shift the position of the lever by using an instrument with a pointed end, like a clip or ball-point pen.  
Position A: Select this when documents do not feed.  
Position C: Select this when documents multiple feed.
- (3) Close the front lid by gently pressing down on both ends.

### 3 CONFIRMING THE SEPARATION SPRING

1. Open the front lid.
2. Check the highest level of the separation spring with the spring height tool (PFZZFT31BX). Please make sure that the separation spring does not touch the tool during this operation. (Both right and left) (See Fig. 1.)
3. Check the lowest level of the separation spring with the opposite side of the spring height tool. Please make sure that the separation spring touches the tool during this operation. (Both right and left) (See Fig. 2.)

Note : Remove the separation rubber first.

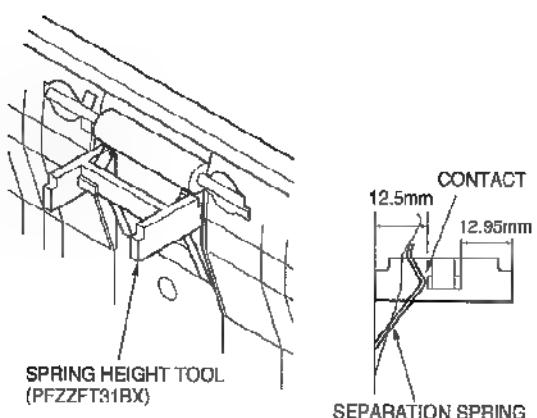
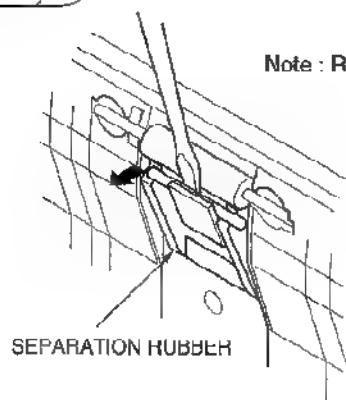


Fig. 1

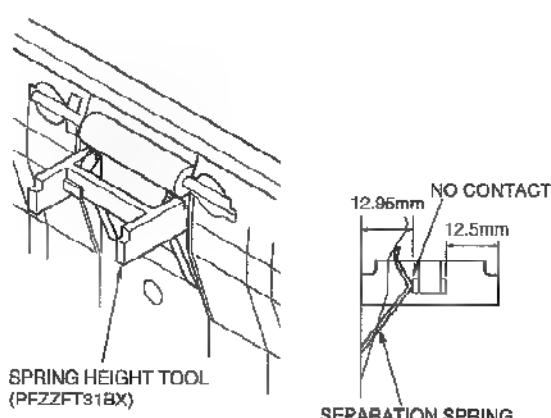


Fig. 2

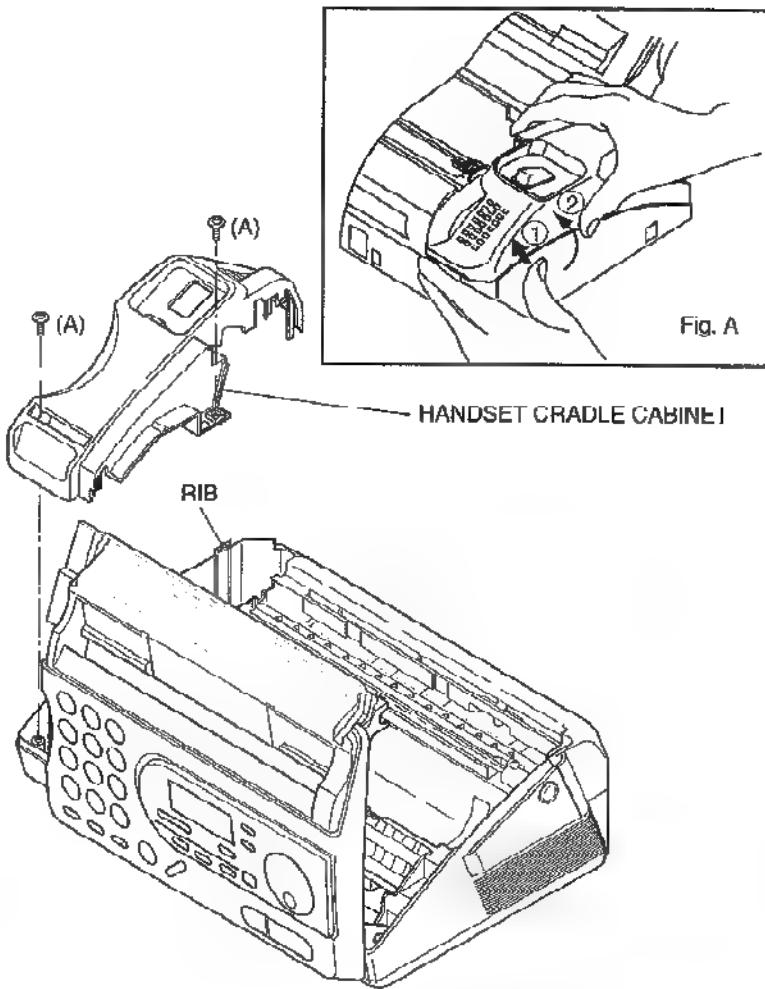
## DISASSEMBLY INSTRUCTIONS

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Ref. No. 1

**HOW TO REMOVE THE HANDSET CRADLE CABINET**Procedure  
1

- 1) Push the front ■ open button to open the operation block.
- 2) Remove the 2 screws (A).
- 3) Remove the handset cradle cabinet. (See Fig. A.)



**Caution:** If you try to remove the handset cradle in the opposite direction, the rib will break.

- ① Push here to remove the lock of the handset cradle. (See Fig. B.)
- ② Lift up the cradle while pushing ①.

**● HOW TO ATTACH THE HANDSET CRADLE CABINET**

- 1) Insert the handset cabinet into the side of the unit. (See Fig.B.)
- 2) Be careful not to bend the cabinet.

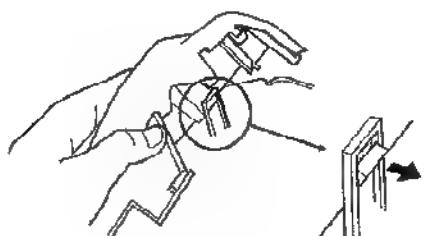


Fig. B

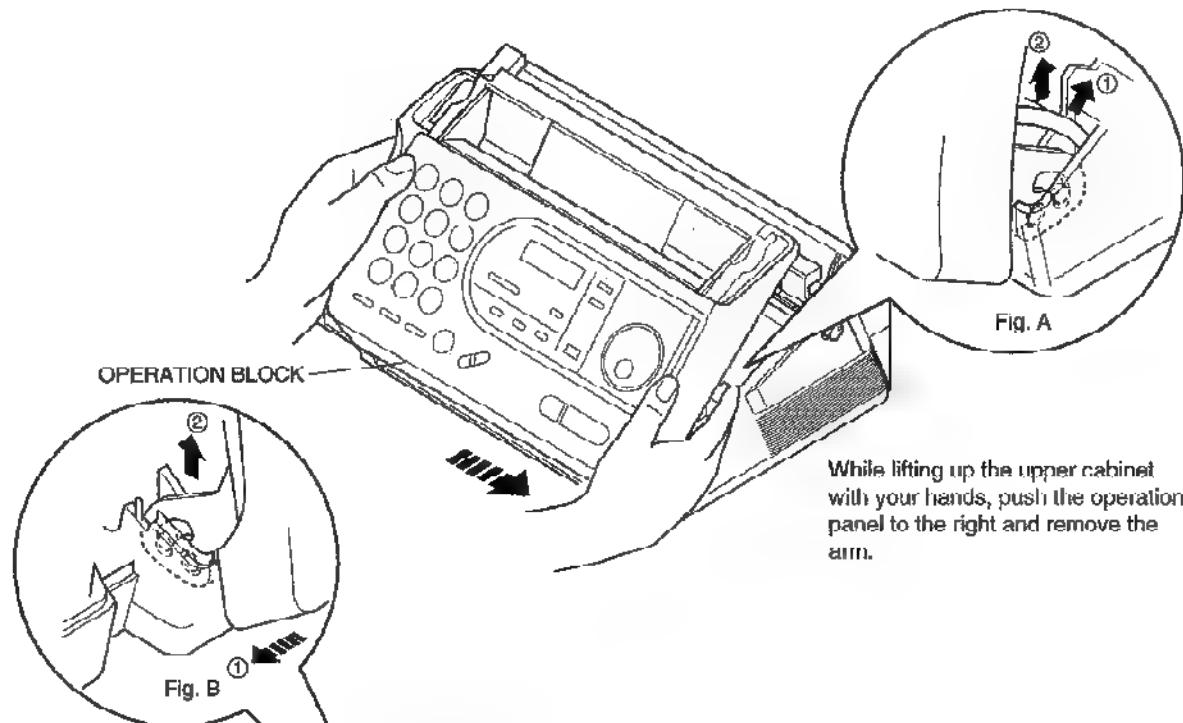
Ref. No. 2

## HOW TO REMOVE THE OPERATION BLOCK

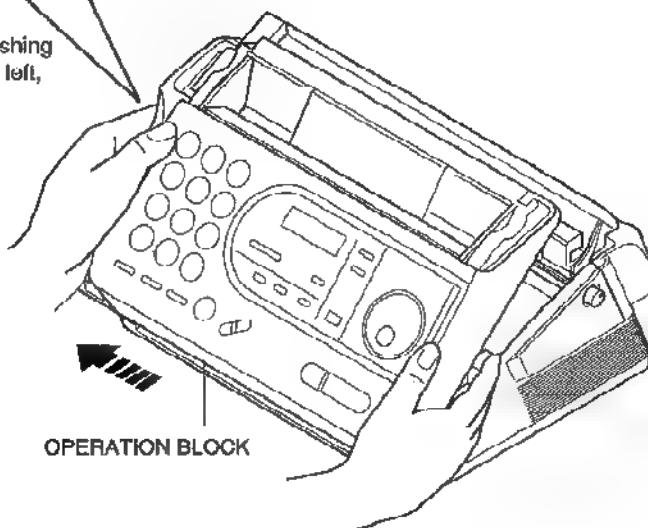
Procedure  
2

- 1) Push the front  open button in the direction of the arrow to open the operation block.
- 2) Lift up the lead and remove the arm (See Fig. A.)
- 3) Remove the arm.(See Fig. B.)
- 4) Lift up the operation block.

**Note:** The arm cannot be removed if the operation panel is opened all the way. Open the operation panel approximately at a 45° to 60° angle to remove the arm.



Remove the arm while pushing the operation panel to the left, as in Fig. A.



DISASSEMBLY INSTRUCTIONS

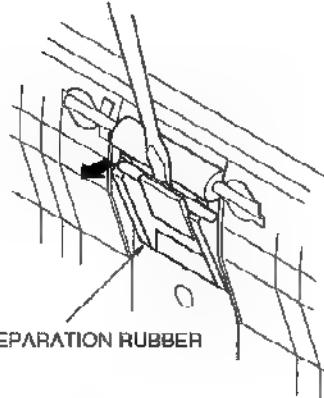
Ref. No. 3

## HOW TO REMOVE THE OPERATION BOARD AND LCD

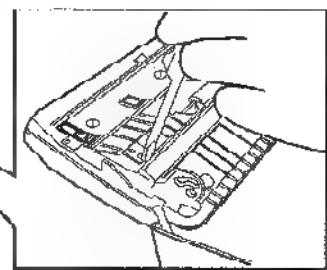
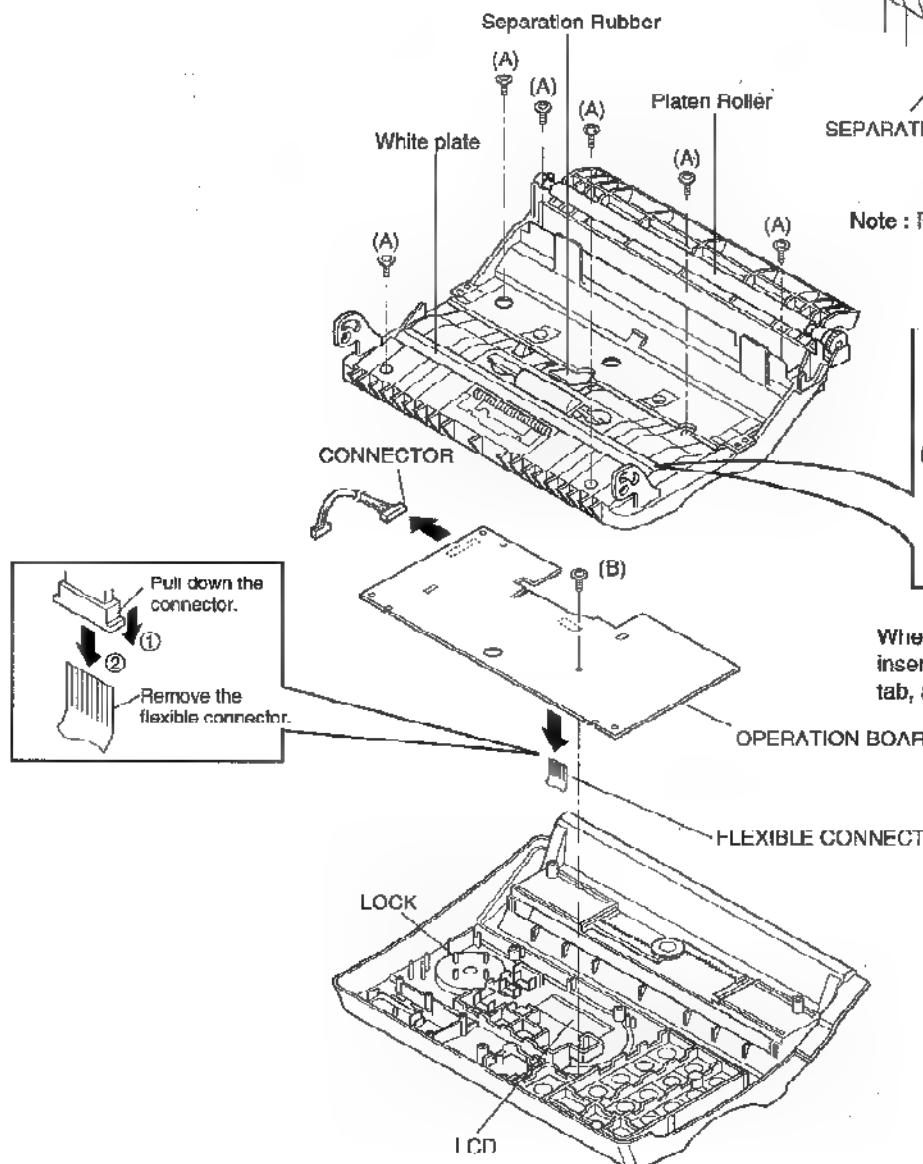
Procedure  
2→3

- 1) Remove the 6 screws (A) and the operation block cover.
- 2) Remove the 1 screw (B).
- 3) Remove the lock of the operation panel
- 4) Pull out the connector and remove the flexible connector.
- 5) Remove the operation board.
- 6) Remove the LCD.

## ● HOW TO REMOVE THE SEPARATION RUBBER

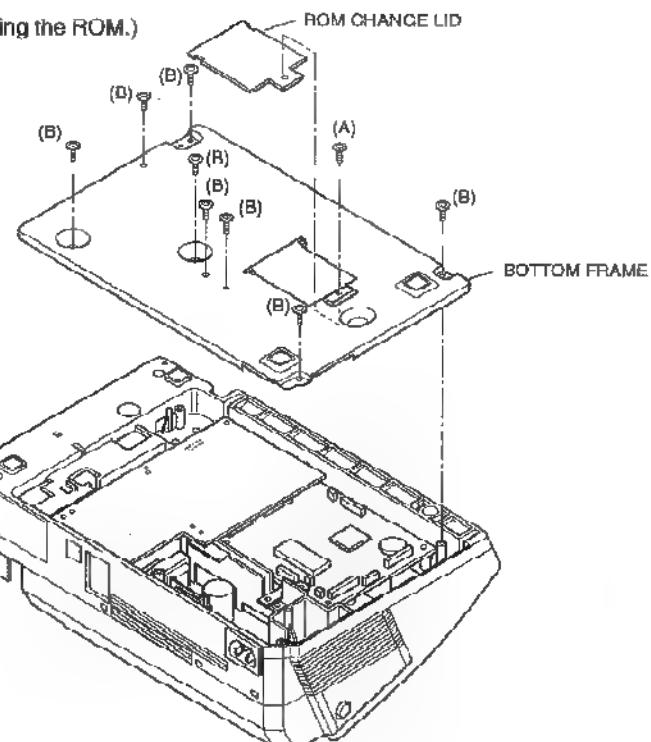
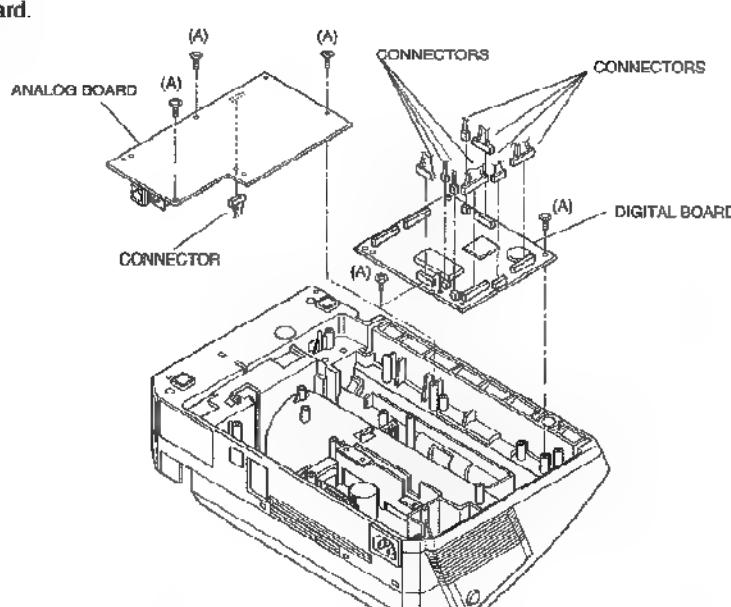


Note : Remove the separation rubber first.



When removing the white plate,  
insert a driver into the hole to unlock a  
tab, and then slide the white plate.

**HOW TO CLEAN:**  
Clean the roller with a  
cloth soaked in alcohol.

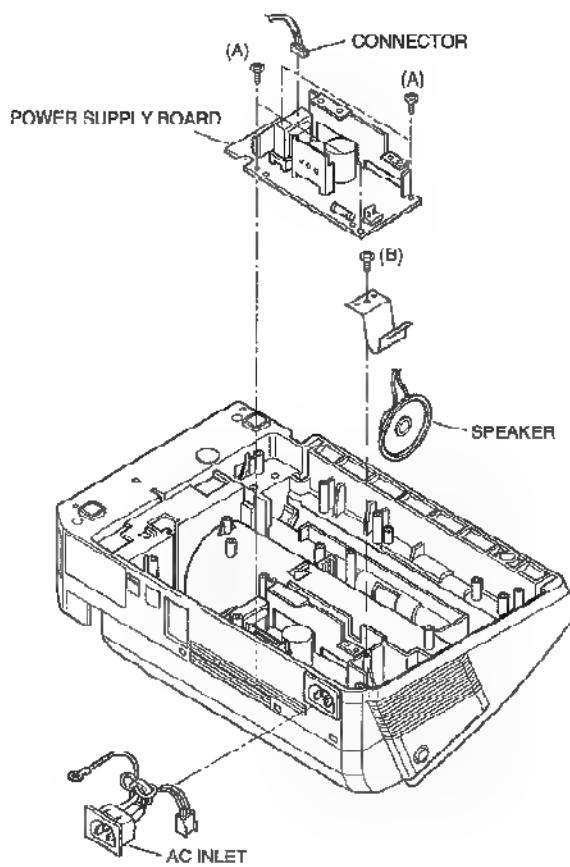
Ref. No. 4	<b>HOW TO REMOVE THE BOTTOM FRAME</b>
Procedure 4	<ol style="list-style-type: none"> <li>1) Remove the screw (A). (If changing the ROM.)</li> <li>2) Remove the ROM change lid.</li> <li>3) Remove the 11 screws (B).</li> <li>4) Remove the bottom frame.</li> </ol> 
Ref. No. 5	<b>HOW TO REMOVE THE ANALOG BOARD AND DIGITAL BOARD</b>
Procedure 4→5	<ol style="list-style-type: none"> <li>1) Remove the 3 screws (A).</li> <li>2) Remove the 1 connector.</li> <li>3) Remove the analog board.</li> <li>4) Remove the 7 connectors.</li> <li>5) Remove the 2 screws (A).</li> <li>6) Remove the digital board.</li> </ol> 

Ref. No. 6

**HOW TO REMOVE THE POWER SUPPLY BOARD, SPEAKER AND AC INLET**

Procedure  
4→5→6

- 1) Remove the 4 screws (A) and remove the power supply board.
- 2) Remove the 1 screw (B).
- 3) Remove the AC inlet.
- 4) Remove the speaker

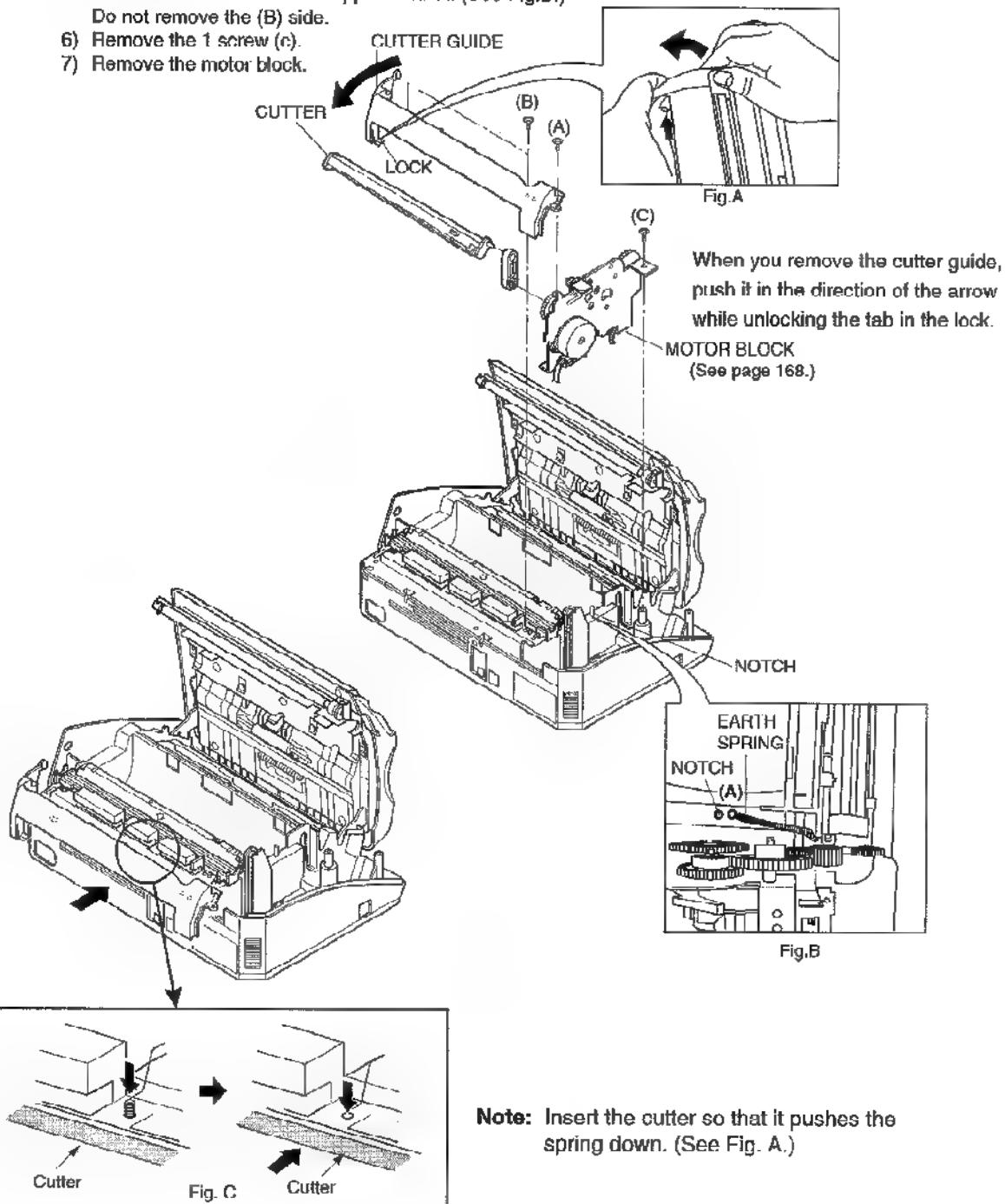


Ref. No.7

## HOW TO REMOVE THE CUTTER AND THE MOTOR BLOCK

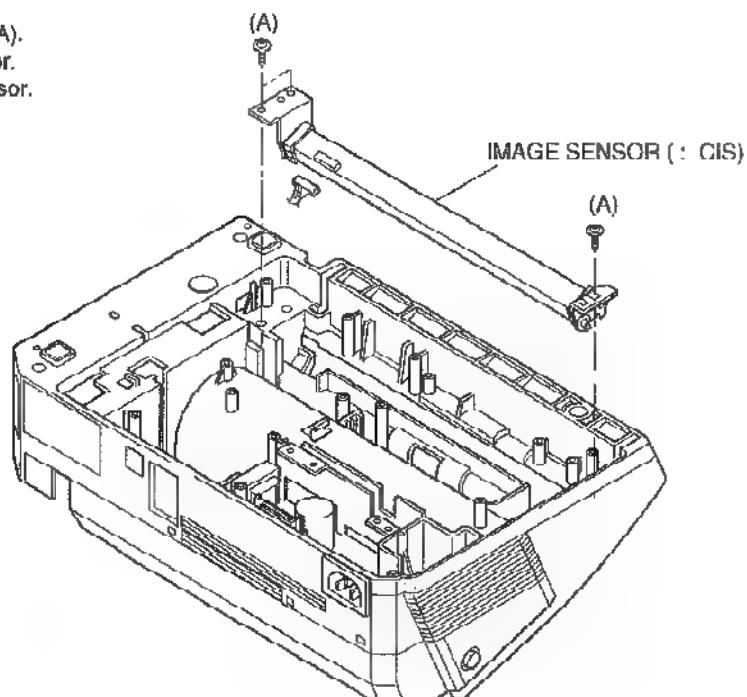
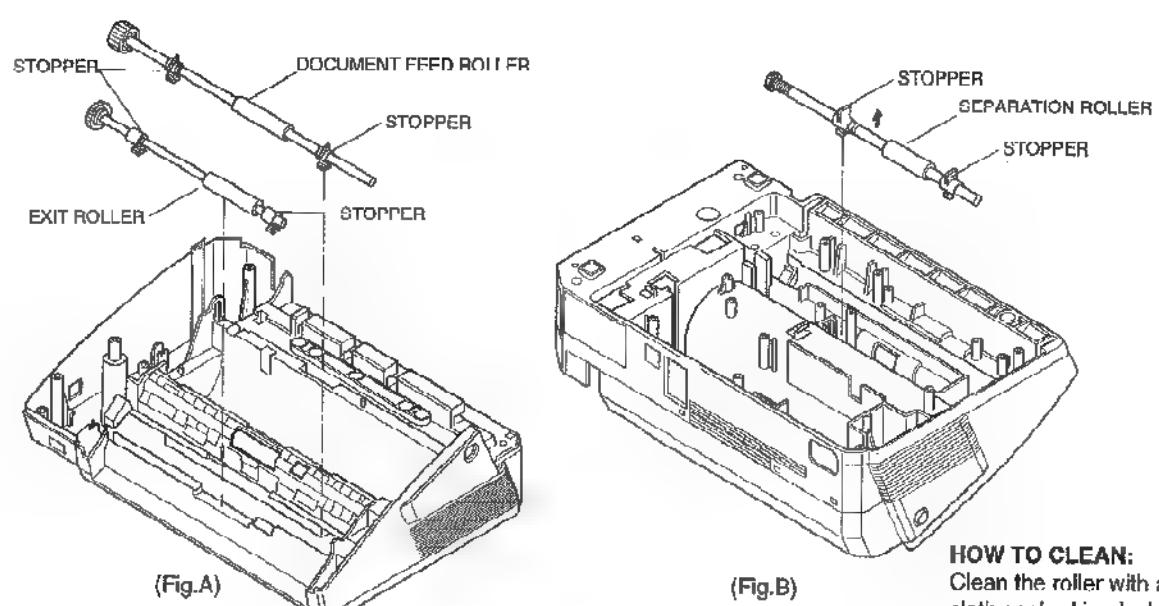
Procedure  
1→7

- 1) Remove the 1 screw (A).
- 2) Remove the cutter guide (See Fig.A.).
- 3) Remove the 2 screws (B).
- 4) Remove Cutter.
- 5) Remove the (A) side of the spring and attach it to the notch on the upper cabinet. (See Fig.B.)  
Do not remove the (B) side.
- 6) Remove the 1 screw (C).
- 7) Remove the motor block.



**Note:** Insert the cutter so that it pushes the spring down. (See Fig. A.)

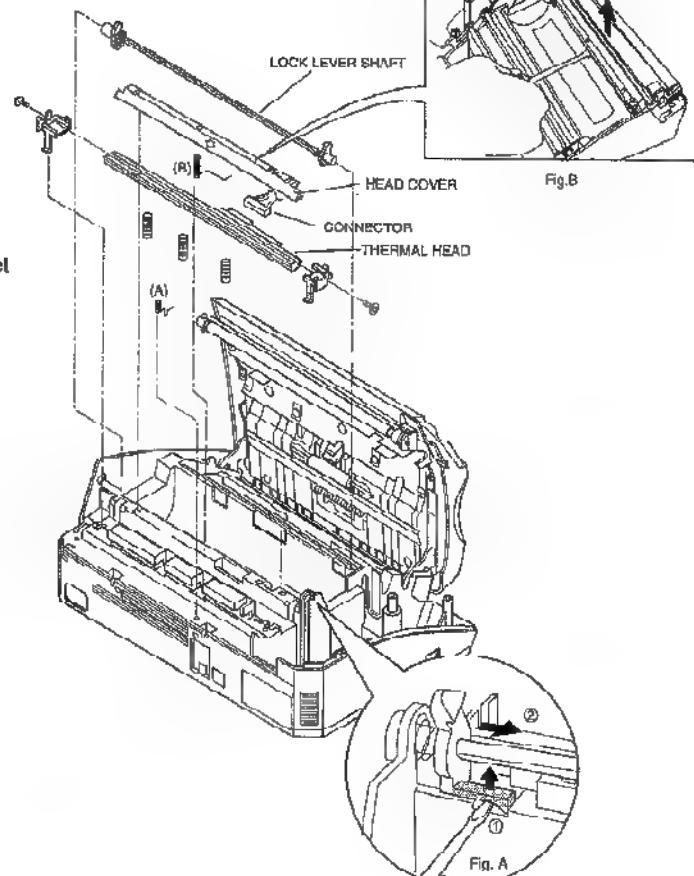
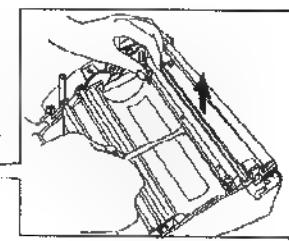
## KX-FT37AL

Ref. No. 8	<b>HOW TO REMOVE THE IMAGE SENSOR</b>
Procedure 4→5→8	<ol style="list-style-type: none"> <li>1) Remove the 3 screws (A).</li> <li>2) Remove the 1 connector.</li> <li>3) Remove the image sensor.</li> </ol> 
Ref. No. 9	<b>HOW TO REMOVE THE ROLLERS</b>
Procedure 1→4→5 →8→9	<p>(Fig.A)</p> <ol style="list-style-type: none"> <li>1) Remove the recording paper guide and the motor block.(See Ref. 7.)</li> <li>2) Remove the stopper with a flathead screwdriver.</li> <li>3) Remove the rollers.</li> <li>2) Remove the stoppers from the roller shaft and replace the roller.</li> </ol> <p>(Fig.B)</p> <ol style="list-style-type: none"> <li>1) Remove the analog board and digital board.(See Ref. 5.)</li> <li>2) Remove the roller.</li> <li>3) Remove the stoppers from the roller shaft and replace the roller.</li> </ol>  <p><b>HOW TO CLEAN:</b> Clean the roller with a cloth soaked in alcohol.</p>

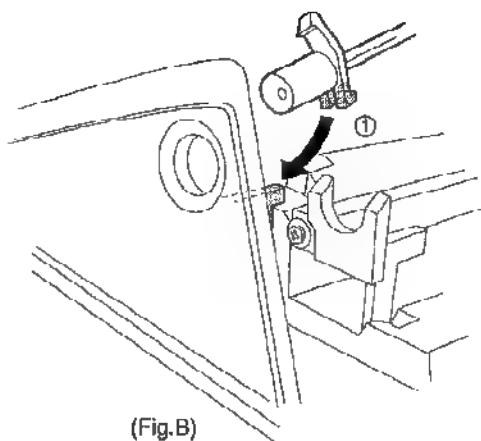
Ref. No. 10

**HOW TO REMOVE THE THERMAL HEAD ROLLER**Procedure  
10

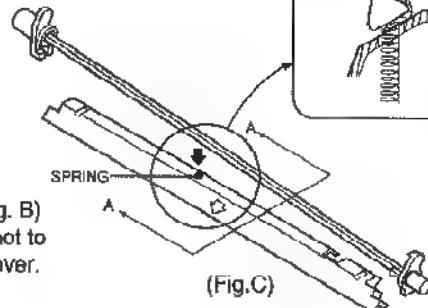
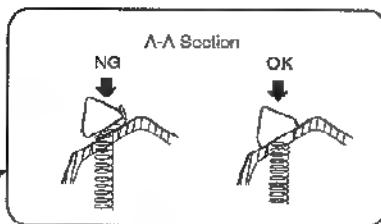
- 1) Push the front lid open button in the direction of the arrow to open the operation block.
- 2) Remove the recording paper guide.(See Ref. 7.)
- 3) Remove the lock lever shaft with a screwdriver as shown in Fig. A.
- 4) Remove the head cover.
- 5) Remove the 1 connector.
- 6) Remove the thermal head.



**Note :** When connecting the thermal head, do not let the connector plug touch the spring (A). (Avoid short circuit with the connector of the thermal head.)

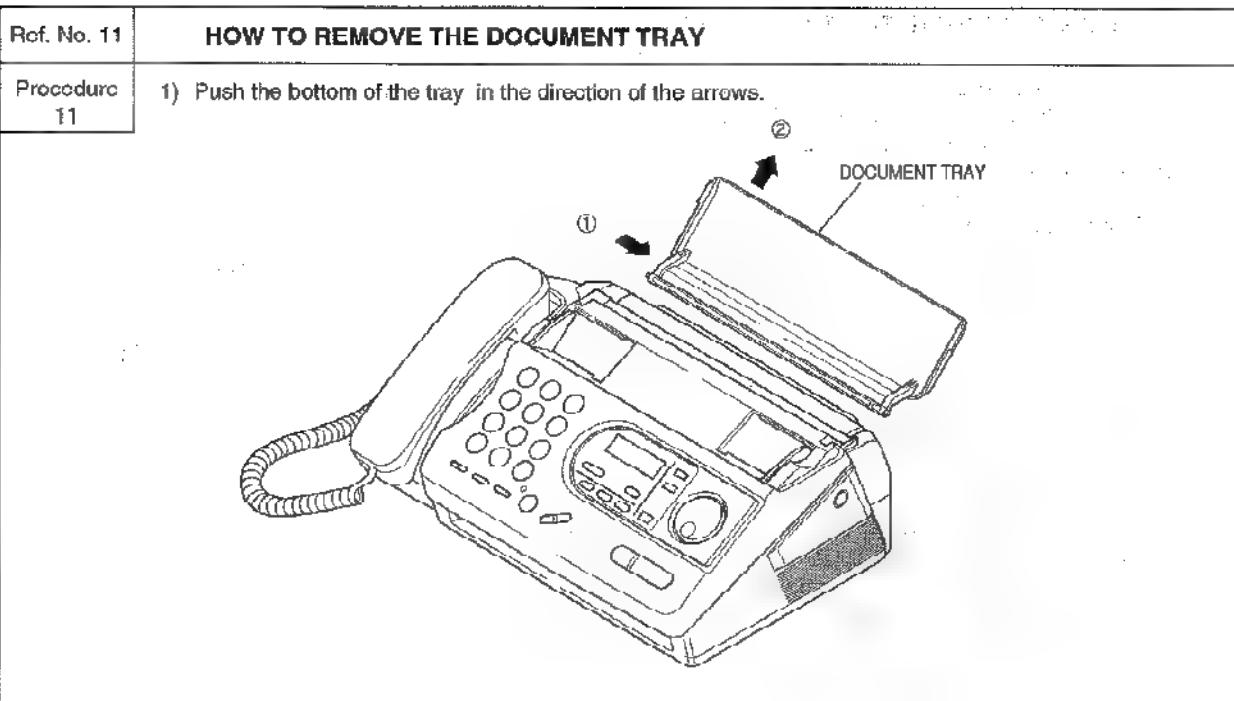
**● HOW TO ATTACH THE LOCK LEVER SHAFT**

Front view

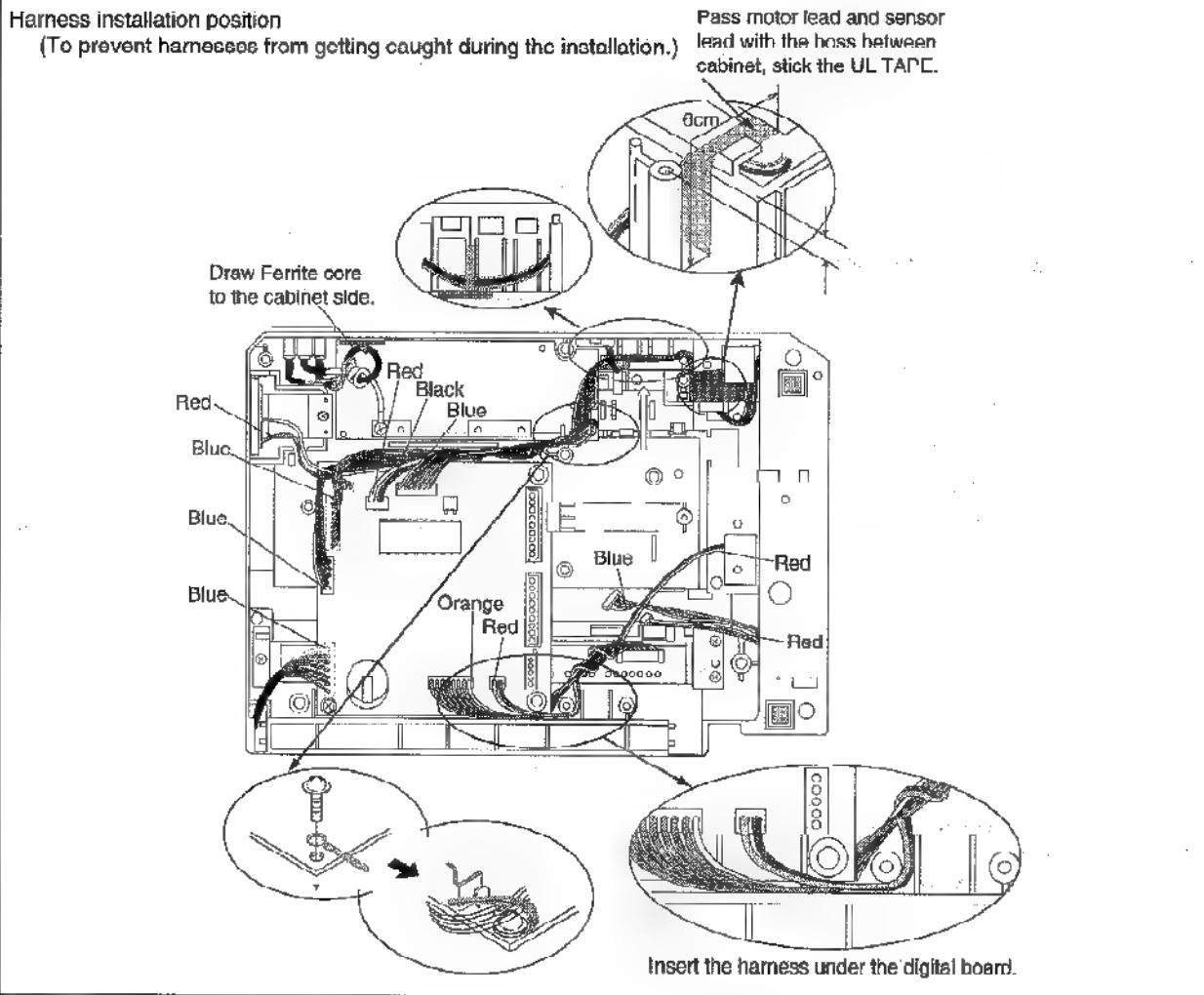


**Note 1 :** Attach the lock lever shaft to the gray area and then insert the shaft through the hole. (Fig. B)

**Note 2 :** When attaching the lock lever shaft, be sure not to bend the spring (B) exposed from the head cover. (Fig. C)



[(Ref. No.5) for page 97]



## HOW TO REPLACE THE FLAT PACKAGE IC

If you do not have the special tools (for example: SPOT HEATER) to remove the Flat IC with solder, a soldering iron, and a blade, you can easily remove the ICs.

### 1. PREPARATION

- SOLDER - - - - - Sparkle Solder 115A-1, 115B-1  
OR  
Almit Solder KR-19, KR-19RMA
- Soldering iron - - - - - Recommended power consumption is between 30 W to 40 W.  
Temperature of Copper Rod 662 + 50 °F (350 + 10 °C)

(An expert may handle a 60-80 W iron, but a beginner might damage the foil by overheating.)

- Flux - - - - - HI115      Specific gravity 0.863

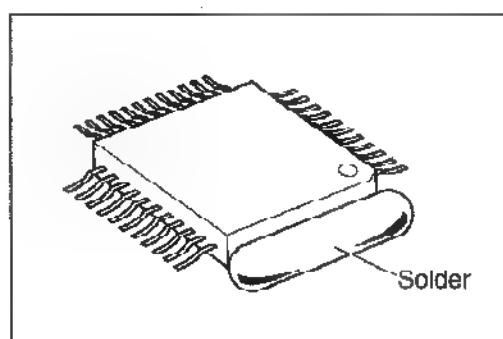
(Original flux should be replaced daily.)

### 2. FLAT PACKAGE IC REMOVAL PROCEDURE

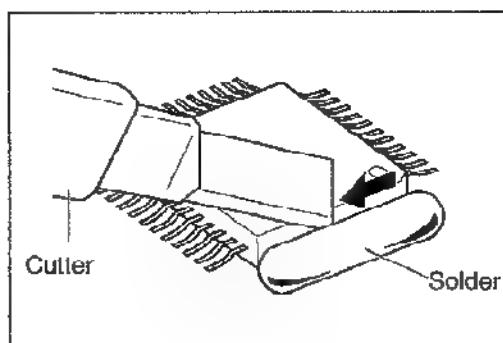
- 1) Bridge the pins with large quantities of solder.

**Note:**

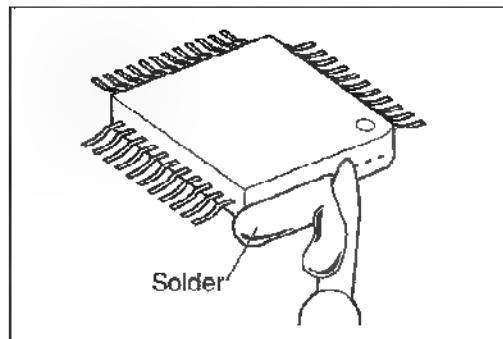
The solder bridge helps protect the tracks from damage when cutting.



- 2) Using a blade, cut the pins close to the IC body.



- 3) Remove the solder bridge (with the pins).



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After removing the Flat IC and when attaching a new IC, remove any of the excess solder on the land using the soldering wire, etc. If the excess solder is not removed from the land, the IC will slip and not be attached properly.

### 3. FLAT PACKAGE IC INSTALLATION PROCEDURE

- 1) Temporarily fix the FLAT PACKAGE IC by soldering on the two marked pins.

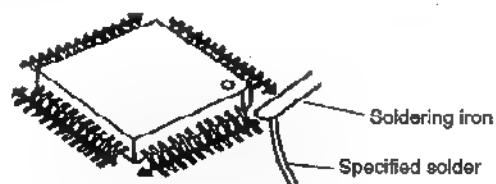


\*Check the accuracy of the IC setting with the corresponding soldering foil.

- 2) Apply flux to all pins of the FLAT PACKAGE IC.



- 3) Solder using the specified solder, in the direction of the arrow, by sliding the soldering iron.



### 4. BRIDGE MODIFICATION PROCEDURE

- 1) Lightly re-solder the bridged portion.
- 2) Remove the remaining solder along the pins using a soldering iron as shown in the figure below.

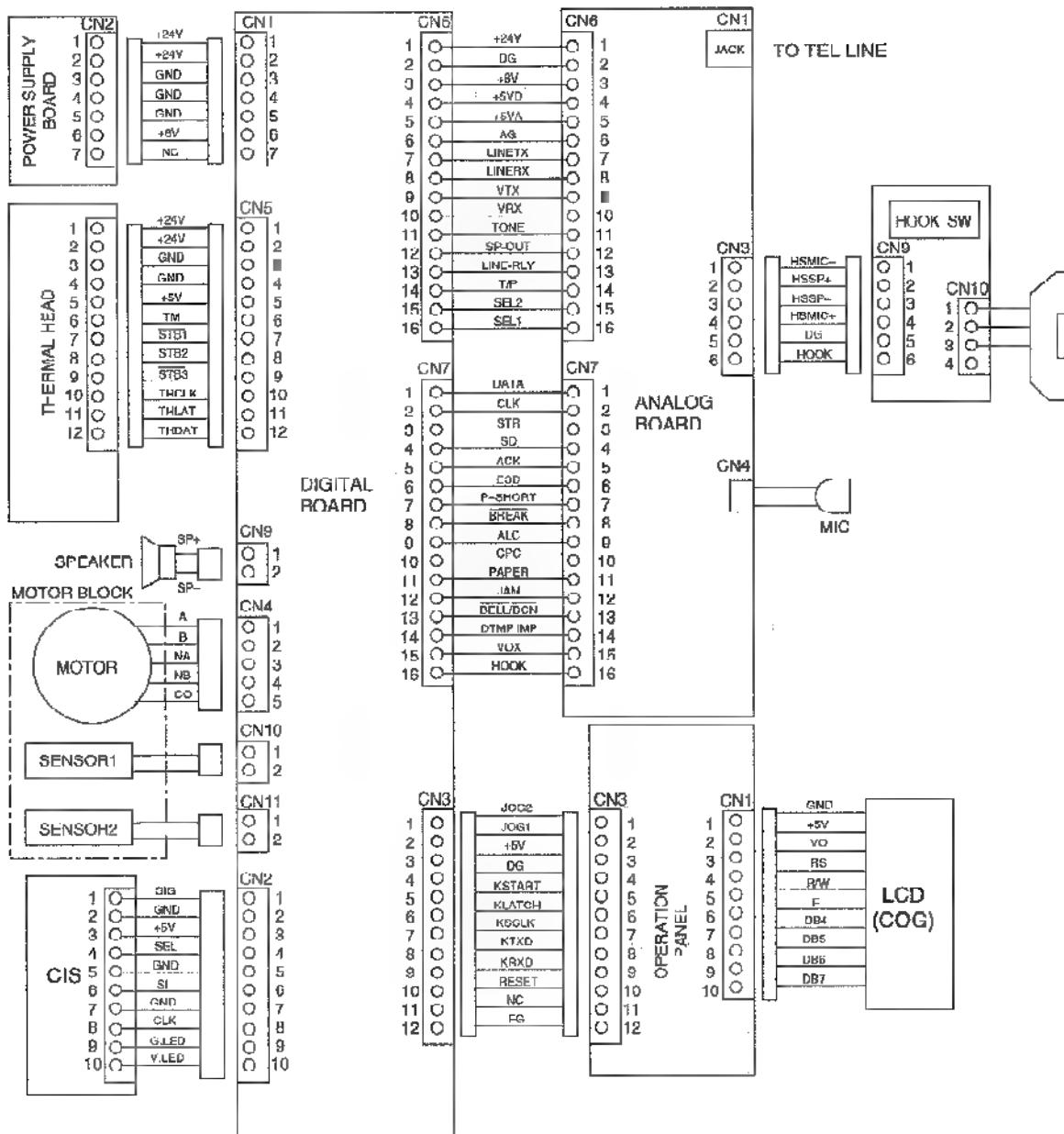


# CIRCUIT OPERATIONS

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## KX-FT37AL

### 1. CONNECTION DIAGRAM



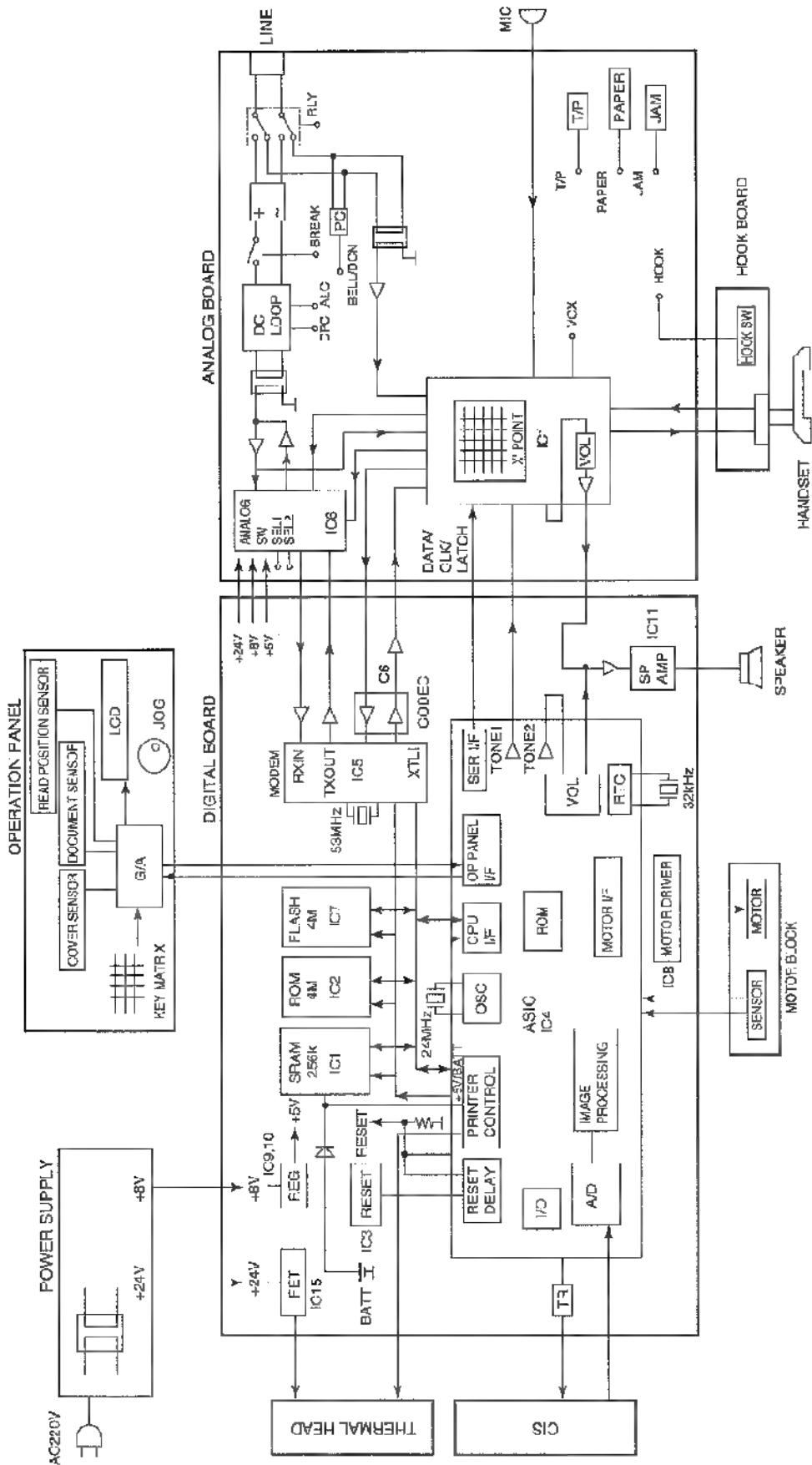
## 2. GENERAL BLOCK DIAGRAM

The control section will be explained as shown in the block diagram.

- (1) ASIC (IC4) ..... Composed mainly of an address decoder, modem control section, CPU and RTC.
  - Controls the general FAX operations.
  - Controls the operation panel I/F.
  - Controls the thermal head I/F and CIS I/F.
  - Executes image processing.
  - I/O ports
- (2) ROM (IC2) ..... Contains all of the program instructions for unit operations and voice prompt for TAM.
- (3) Static RAM (IC1) ..... This memory is used mainly for the parameter working storage area.
- (4) Flash memory (IC7) .... This memory is used for TAM.
- (5) MODEM (IC5) ..... Executes modulation and demodulation for the FAX and SP-Phone communication.
- (6) CODEC (IC6) ..... Executes code and decode for Digital SP-Phone communication.
- (7) Read section ..... Contact Image Sensor (CIS) to read transmitting documents.
- (8) Thermal head ..... Contains heating elements for dot matrix image printing.
- (9) Motor driver (IC8) ..... Drives the motor and CIS LED.
- (10) Reset circuit (IC3) ..... The reset pulse is made from 5V power supply, and then it is input to ASIC(IC4).
- (11) Analog board ..... Composed of an ITS circuit and NCU circuit.
- (12) Sensor section ..... Composed of a cover open sensor, document sensor, recording paper sensor, JAM sensor, motor position sensors, read position sensor.
- (13) Power supply ..... Supplies +8V and +24V to the unit.

## KX-FT37AL

### General Block Diagram



### 3. CONTROL SECTION

#### ① ASIC (IC4)

This custom IC is used for general FAX operations.

(1) CPU:	This model uses a Z80 equivalent CPU operating at 6MHz.
	Many of the peripheral functions are handled by custom designed LSI's.
	As a result, the CPU only needs to process the result.
(2) RTC:	Real time clock.
(3) DECODER:	Decodes the address.
(4) ROM/RAM I/F:	Controls the SELECT signal of ROM or RAM and bank switching.
(5) CIS I/F:	Controls document reading.
(6) IMAGE DATA RAM:	This is inside the ASIC and has 8KB which is used for image processing.
(7) THERMAL HEAD I/F:	Transmits the recorded data to the thermal head.
(8) MOTOR I/F:	Controls the motor which feeds the document and feeds the recording paper.
(9) OPERATION PANEL I/F:	Serial interface with Operation Panel.
(10) I/O PORT:	I/O Port Interface (for analog board port control).
(11) ANALOG UNIT:	Electronic volume for the handset and monitor.
	Sends beep tones, etc.
(12) RESET CIRCUIT:	The reset pulse from IC3 causes the system reset.

#### Explanation of the Pin Distribution (IC4)

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
1	AIN1	AI	3.3V	ANALOG IMAGE SIGNAL INPUT
2	AIN2	AI	3.3V	THERMISTOR TEMPERATURE DETECTION INPUT
3	AMON	AO	3.3V	ANALOG MONITOR
4	VSSB		GND	GROUND FOR ANALOG IMAGE PROCESS
5	VDBB		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
■	3.3V/BATT		3.3V/BATT	BACKUP POWER SOURCE FOR RTC
7	X32OUT	O	3.3V/BATT	32.768k OSCILLATOR FOR RTC
8	X32IN	I	3.3V/BATT	32.768k OSCILLATOR FOR RTC
9	VSS		GND	GROUND
10	XBACKEN	I	5V	BACKUP ENABLE
11	5V/BATT		5V/BATT	RAMCS BUFFER/BACKUP POWER SOURCE FOR RESET
12	XRAMCS	O	5V/BATT	SRAM CHIP SELECT
13	FTG	O	5V	SH SIGNAL OUTPUT FOR CIS
14	F1	O	5V	SIGNAL OUTPUT FOR CIS
15	F2/OP50	O	5V	R-FNARI F (NOT USED)
16	FR/OP51	O	5V	RESET IN (NOT USED)
17	VIDRST/IOP20	I/O	5V	SP-MUTE (SPEAKER MUTE)
18	SPHCLK/IOP21	I/O	5V	HOOK (HANDSET HOOK DETECTION)
19	DARKON/IOP22	I/O	5V	VOX (TAM VOX DETECTION)
20	ADSEL2/IOP23	I/O	5V	DTMF IMP(NOT USED)
21	CPC	I	5V	CPC
22	BELL/OP	O/Z	5V	ACK (ANALOG IC2 CONTROL)
23	5V		5V	POWER SOURCE FOR BUFFER
24	VSS		GND	GROUND
25	RVN	I	5V	T/P (TONE/PULSE SWITCHING)

**KX-FT37AL**

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
26	TXD/IOP30	I/O	5V	BREAK (LINE CATCHING CONTROL)
27	HXD/IOP31	I/O	5V	P-SHORT (NOT USED)
28	XRTS/IOP32	I/O	5V	ESD (ANALOG IC 2 CONTROL)
29	XCTS/IOP33	I/O	5V	PAPER (RECORDING PAPER DETECTION)
30	XDSR/IOP34	I/O	5V	SD (ANALOG IC2 CONTROL)
31	DCD/IOP35	I/O	5V	BELL/DCN (BELL DETECTION/AUTO DISCONNECT DETECTION)
32	XDTR/IOP36	I/O	5V	JAM (RECORDING PAPER JAM DETECTION)
33	RI/CLK/IOP37	I/O	5V	LINE-RLY (LINE RELAY CONTROL)
34	TONE1	AO	3.3V	TONE1 (DUMMY RING BACK TONE TRANSMISSION)
35	TONE2	AO	3.3V	TONE2 (ALARM, KEY TONE, BELL TRANSMISSION)
36	VOLU1		3.3V	ELECTRONIC VOLUME FOR SPEAKER (REF. VOLTAGE)
37	VOU1P		3.3V	ELECTRONIC VOLUME FOR SPEAKER
38	VOLU3		3.3V	ELECTRONIC VOLUME FOR SPEAKER
39	MIDAT/IOP45	I/O	5V	MIDAT (ANALOG IC1 CONTROL)
40	MICLK/IOP46	I/O	5V	MICLK (ANALOG IC1 CONTROL)
41	MILAT/IOP47	I/O	5V	MILAT (ANALOG IC1 CONTROL)
42	XRFSCS1	O	5V	CHIP SELECT1 (NOT USED)
43	XRESCS2	O	5V	CHIP SELECT2 (NOT USED)
44	VSS		GND	GROUND
45	5V		5V	POWER SOURCE FOR BUFFER
46	XNMI	I	5V	NMI INPUT (FIXED 5V)
47	CBUSY2	O	5V	CBUSY2 (NOT USED)
48	CSO	O	5V	CSO (NOT USED)
49	CBUSY1	I	5V	CBUSY1 (NOT USED)
50	CCLK	I	5V	CCLK (NOT USED)
51	CSI	I	5V	CSI (NOT USED)
52	XMDMINT	I	5V	MODEM INSERTING
53	XMDMCS	O	5V	MODEM CHIP SELECT
54	XRESCS3/IOP52	O	5V	OPRES (OPERATION PANEL RESET)
55	20KOSC/IOP56	I/O	5V	CLE (FLASH MEMORY CONTROL)
56	XHOLDAK	O	5V	NOT USED
57	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
58	XOUT	O	3.3V	24MHz OSCILLATOR
59	XIN	I	3.3V	24MHz OSCILLATOR
60	VSS		GND	GROUND
61	5V		5V	POWER SOURCE FOR BUFFER
62	XTEST	O	5V	24MHz CLOCK OUTPUT (FOR MODEM)
63	CPUCK	O	5V	CPU CLOCK (6MHz) OUTPUT
64	TEST1	I	5V	TEST PIN, FIXED HIGH
65	TEST2	I	5V	TEST PIN, FIXED HIGH
66	TEST3	I	5V	TEST PIN, FIXED HIGH
67	TEST4	I	5V	TEST PIN, FIXED HIGH
68	XWAIT/IOP60	I	GND	FIXED GND
69	XHOLD/IOP61	I	GND	FIXED GND
70	VSS		GND	GROUND
71	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
72	XHSTRD/IOP40	I/O	5V	RE (FLASH MEMORY CONTROL)
73	XHSTWR/IOP41	I/O	5V	WE (FLASH MEMORY CONTROL)
74	XOPRBE	O	5V	NOT USED
	MUX/OP53			

NO.	SIGNAL	I/O	POWER SUPPLIED VIA TAGF	EXPLANATION
75	ADR15	O	5V	ADDRESS PIN FOR DEBUG
76	ADR14	O	5V	ADDRESS PIN FOR DEBUG
77	ADR13	O	5V	ADDRESS PIN FOR DEBUG
78	XRAS/IOP42	I/O	5V	TONE 1 SEL (ANALOG SIGNAL ROUTE CONTROL)
79	XCAS1/IOP43	I/O	5V	TONE 2 SEL (ANALOG SIGNAL ROUTE CONTROL)
80	XCAS2/IOP44	I/O	5V	MDRES (MODEM RESET)
81	DB3	I/O	5V	DATA BUS D3
82	DR2	I/O	5V	DATA BUS D2
83	DB4	I/O	5V	DATA BUS D4
84	DB1	I/O	5V	DATA BUS D1
85	DB5	I/O	5V	DATA BUS D5
86	DB0	I/O	5V	DATA BUS D0
87	DB6	I/O	5V	DATA BUS D6
88	DB7	I/O	5V	DATA BUS D7
89	XROMCS	O	5V	ROM CHIP SELECT
90	VSS		GND	GROUND
91	5V		5V	POWER SOURCE FOR BUFFER
92	XRD	O	5V	READ SIGNAL OUTPUT
93	XWR	O	5V	WRITE SIGNAL OUTPUT
94	ADR0	O	5V	ADDRESS BUS A0
95	ADR1	O	5V	ADDRFSS R1 IS A1
96	ADR2	O	5V	ADDRESS BUS A2
97	ADR3	O	5V	ADDRESS BUS A3
98	ADR4	O	5V	ADDRESS BUS A4
99	ADR5	O	5V	ADDRFSS R1 IS A5
100	ADR6	O	5V	ADDRESS BUS A6
101	ADR7	O	5V	ADDRESS BUS A7
102	ADR8	O	5V	ADDRESS BUS A8
103	ADR9	O	5V	ADDRFSS R1 IS A9
104	ADR10	O	5V	ADDRESS BUS A10
105	ADR11	O	5V	ADDRESS BUS A11
106	ADR12	O	5V	ADDRESS BUS A12
107	RBA0	O	5V	ADDRESS BUS A13
108	VSS		GND	GROUND
109	5V		5V	POWER SOURCE FOR BUFFER
110	RBA1	O	5V	BANK ADDRESS A14
111	RBA2	O	5V	BANK ADDRESS A15
112	RBA3	O	5V	BANK ADDRESS A16
113	RBA4	O	5V	BANK ADDRESS A17
114	RBA5/OP	O	5V	BANK ADDRESS A18
115	FMEMCS/IOP27	I/O	5V	FCE (FLASH MEMORY CONTROL)
116	FMEMDO/IOP26	I/O	5V	ALE (FLASH MEMORY CONTROL)
117	FMEMDI/IOP25	I/O	5V	LEDON (CIS LED CONTROL)
118	FMEMCLK/IOP24	I/O	5V	R/B (FLASH MEMORY CONTROL)
119	XRESET	I	5V	XRESET (RESET INPUT)
120	XORESET1	O	5V	XORESET (RESET OUTPUT)
121	XRESET1	I	5V	RESET PULSE INPUT
122	5V		5V	POWER SOURCE FOR BUFFER
123	VSS		GND	GROUND
124	XWDERR	O	5V	WATCH DOG ERROR
125	IOP57	I/O	5V	CISON (CIS 5V POWER SOURCE CONTROL)
126	RM0/IOP00	I/O	5V	T5 (MOTOR A PHASE)
127	RM1/IOP01	I/O	5V	T4 (MOTOR B PHASE)
128	RM2/IOP02	I/O	5V	T3 (MOTOR A PHASE)

## KX-FT37AL

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
129	RM3/IOP03	I/O	5V	T2 (MOTOR B PHASE)
130	RXE/IP14	I/O	5V	T0 (MOTOR ENABLE CONTROL)
131	TM0/IOP10	I/O	5V	SEN2 (MOTOR POSITION SENSOR 2)
132	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
133	VSS		GND	GROUND
134	TM1/IOP11	I/O	5V	JOG 2 (JOG DIAL PORT)
135	TM2/IOP12	I/O	5V	JOG 1 (JOG DIAL PORT)
136	TM3/IOP13	I/O	5V	THON (THERMAL HEAD +24V CONTROL)
137	TXE/IP14	I/O	5V	SEN 1 (MOTOR POSITION SENSOR 1)
138	STB1	O	5V	THERMAL HEAD STROBE 1
139	STB2	O	5V	THERMAL HEAD STROBE 2
140	STB3	O	5V	THERMAL HEAD STROBE 3
141	STB4	O	5V	NOT USED
142	5V		5V	POWER SOURCE FOR BUFFER
143	VSS		GND	GROUND
144	STBNP	I	5V	CISSEL (CIS CONTROL)
145	IHDAT	O	5V	THFRMAL HEAD DATA
146	THCLK	O	5V	THERMAL HEAD CLOCK
147	THLAT	O	5V	THERMAL HEAD LATCH
148	KSTART	O	5V	OPERATION PANEL I/F
149	KLATCH	O	5V	OPERATION PANEL I/F
150	KSCLK	O	5V	OPERATION PANEL I/F
151	KTXD	O	5V	OPERATION PANEL I/F
152	KRXD	I	5V	OPERATION PANEL I/F
153	ADSEL1	O	5V	THERMAL HEAD TEMPERATURE DETECTION TRIGGER
154	VSSC		GND	ANALOG IMAGE PROCESS GROUND
155	VDDC		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
156	VSSA		GND	GROUND FOR ANALOG IMAGE PROCESS
157	VDDA		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
158	VREFB	AO	ANALOG	A/D REFERENCE
159	VCL	AO	ANALOG	CLAMP LEVEL
160	VREFT	AO	ANALOG	NOT USED

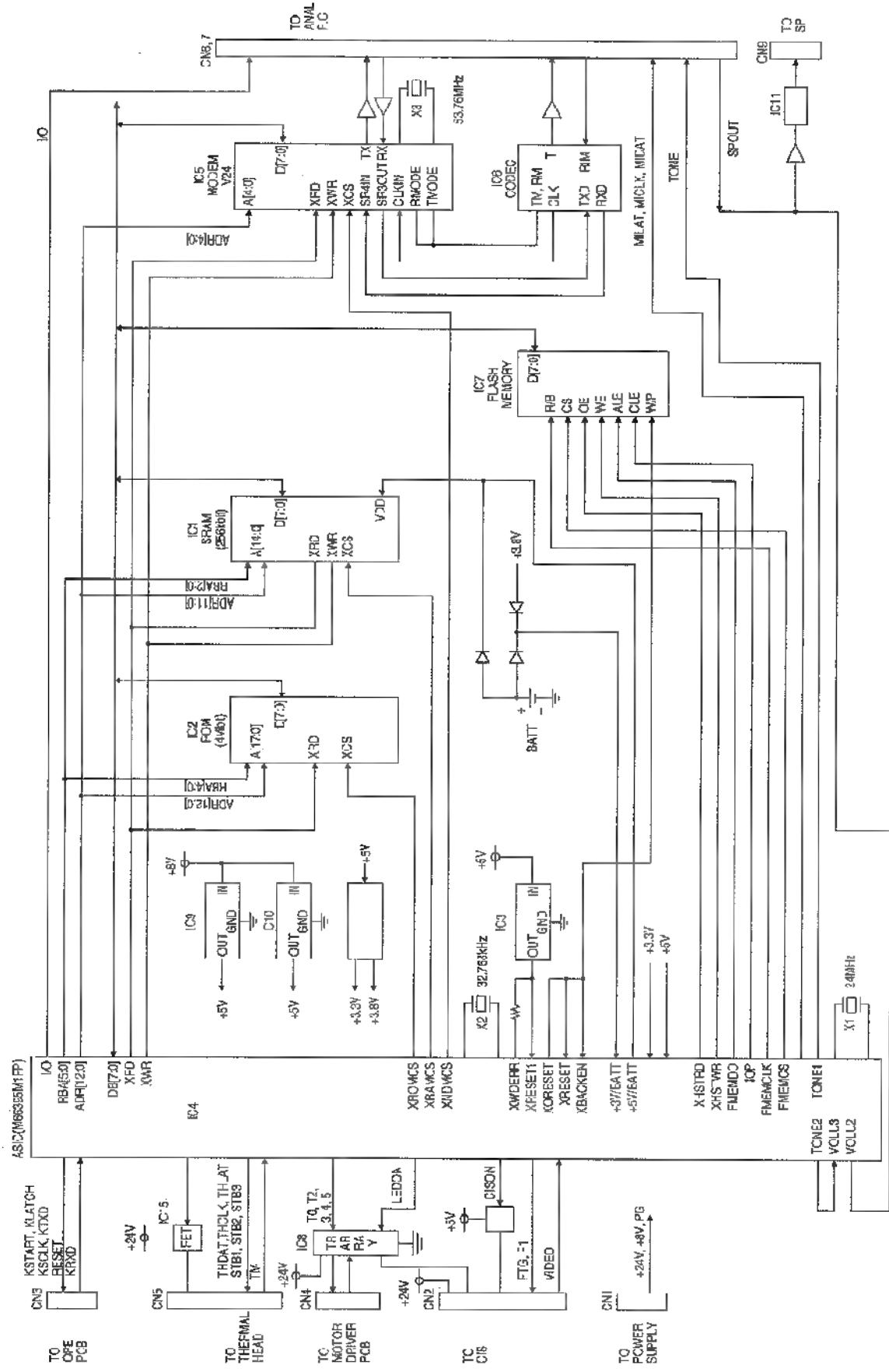
### ② RAM (IC1)

This 32 KB RAM has 8 KB of common area and bank area (BK0, BK1).

The capacity of each bank is 12 KB.

The addresses of the common area are from D000H to EFFFH, and addresses A000H to CFFFH are for the bank area.

## 3-1. BLOCK DIAGRAM



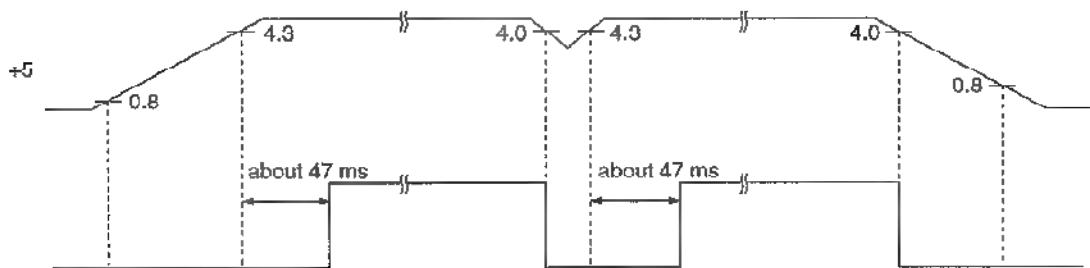
CIRCUIT OPERATIONS

### 3-2. RESET CIRCUIT

When 5V power supply decreases to 4.0V, the reset pulse is output from pin 1 of the Reset IC (IC3), and it is input to pin 121 of IC4. Then after about 47ms, the other reset pulse from pin 120 of IC4 resets the system. The modem (IC5) CODEC (IC 6), SRAM (IC) and the gate array on the operation board (IC1) are also reset by IC4.

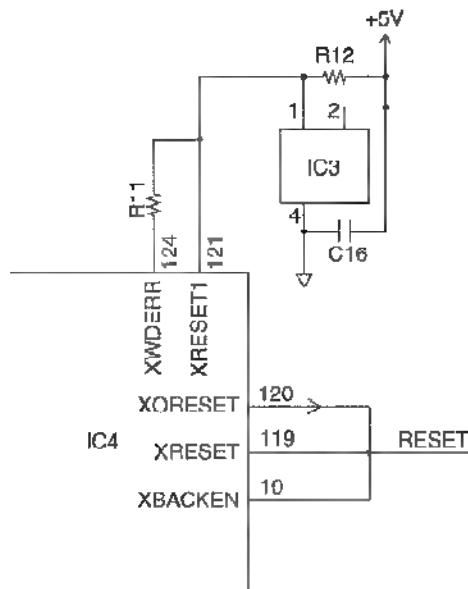
(1) During a power surge, a positive reset pulse of 47 msec or more is generated and the system is reset completely. This is done to prevent partial resetting and system runaway during a power fluctuation.

## Timing Chart



(2) When pin 120 of IC4 becomes low, it will prohibit the RAM (IC1) from changing data. The RAM (IC1) will go into the backup mode, and is backed up by a lithium battery.

### Circuit Diagram



(3) The watch dog timer, built-in the gate array (IC4), is initialized about every 1.5 ms.  
 When a watch dog error occurs, pin 124 of the gate array (IC4) becomes low.  
 The terminal of the WDERR signal is connected to the reset line so the WDERR signal works as the reset signal.

### 3-3. SRAM and RTC BACK UP CIRCUIT

#### (1) Function

This unit has a lithium battery (BATT) which maintains the RAM (IC1) and Real Time Clock IC (RTC, Integrated into ASIC:IC4).

The user parameter for autodial numbers, the transmission ID, the system setup date and so on are stored in the RAM (IC1).

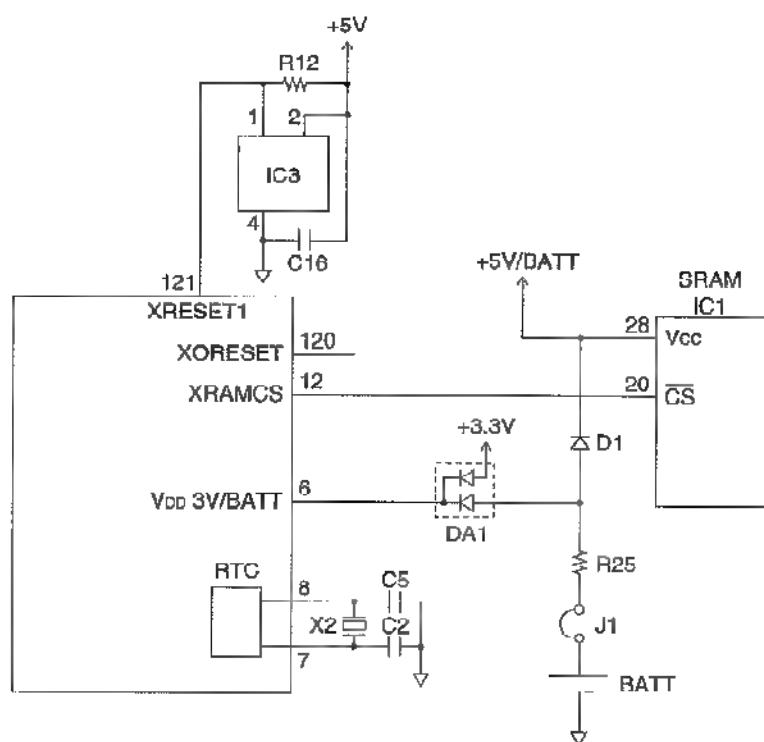
The RTC continues functioning, even when the power switch is OFF, backed up by a lithium battery.

#### (2) Circuit Operation

When the power switch is turned ON, power is supplied RAM (IC1) and RTC (IC4).

At this time, the voltage at pin 28 of RAM is +5V and pin 11 of RTC (IC4) is +3.3V. When the power switch is turned OFF, the BATT supplies the power to RAM and RTC through J1, R25, D1 or DA1. At that time, the voltage at pin 28 of RAM and pin 11 of RTC are about +2.5V. When the power switch is OFF and the +5V and +3.3V voltages decrease, IC3 detects them and LOW is input to pin 121 of IC4. Pin 120 of IC4 outputs the reset signals. Pin 28 of RAM (IC1) and pin 11 of RTC (IC4) become low, then RAM and RTC (IC4) go into the back up mode, to reduce the power consumption.

Circuit Diagram



### 3-4. SUPERVISION CIRCUIT FOR THE THERMAL HEAD TEMPERATURE

#### (1) Function

The thermistor changes its resistance according to the temperature.

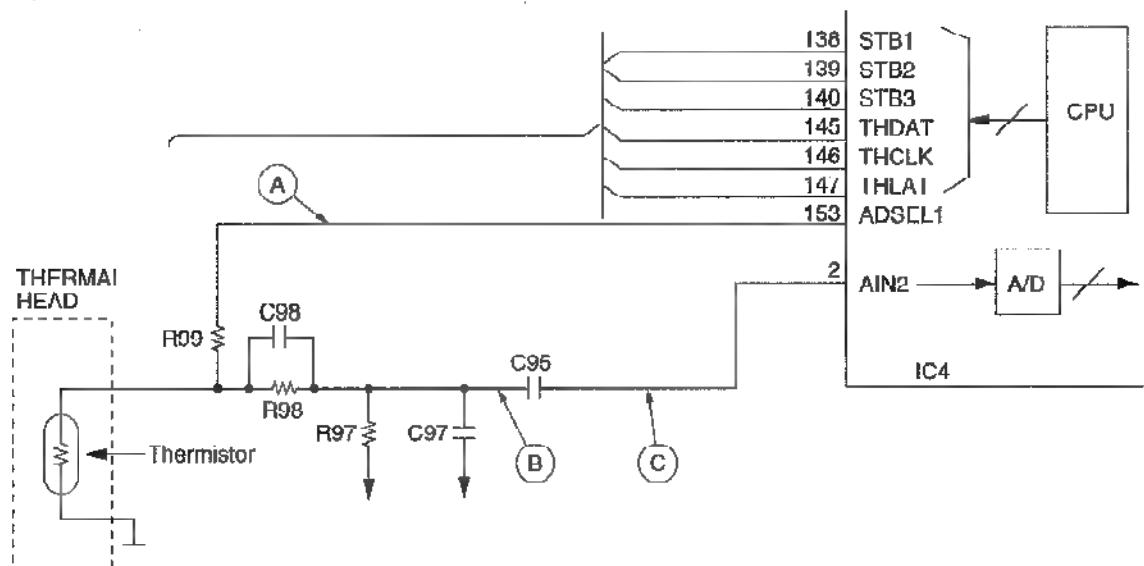
The output of pin 153 of IC4 becomes a low level.

Then when it becomes a high level, it triggers point (A).

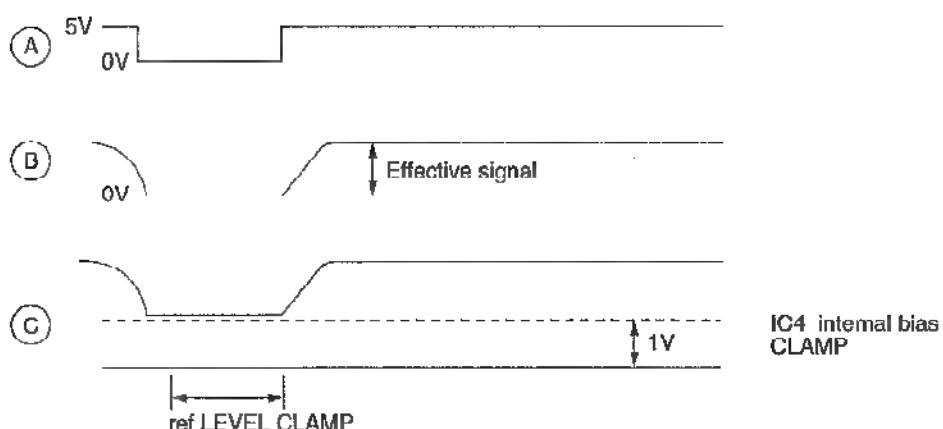
In point (C), according to the voltage output time, the thermal head's temperature is detected.

After the thermal head temperature is converted to voltage in (B), it is then changed to digital data in the A/D converter inside IC4. The CPU decides the strobe width of the thermal head according to this value. Therefore, this circuit can keep the thermal head at an even temperature in order to stabilize the printing density and prevent the head from being overheated.

Circuit Diagram



Timing Chart

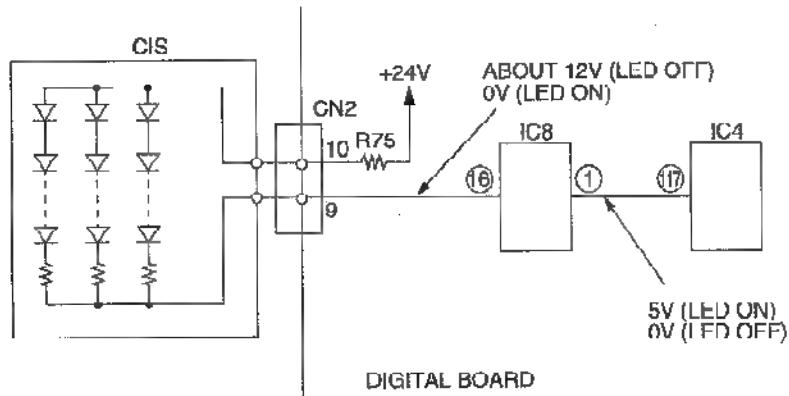


### 3-5. LED ARRAY(CIS)

The LED ARRAY will light during transmission and copying to illuminate characters, patterns, or graphics on a document. It is also possible to light the LED ARRAY in the test mode. (Page 89 scan check in Test Function)

## 4. FACSIMILE SECTION

Circuit Diagram



### 4-1. IMAGE DATA FLOW DURING FACSIMILE OPERATION

#### COPY (Fine, Super-Fine, Half Tone)

- (1) Line information is read by CIS, via route ①, and is input to IC4.
- (2) In IC4, the data is adjusted to a suitable level for A/D conversion in the Analog Signal Processing Section, and via route ② it is input to A/D conversion (8 bit). After finishing A/D conversion, the data is input to the Image Processing Section via route ③. Then via routes ④ and ⑤, it is stored in RAM as shading data.
- (3) The draft's information that is read by CIS is input to IC4 via route ①. After it is adjusted to a suitable level for A/D conversion via route ②, the draft's information is converted to A/D (8 bit), and it is input to the Image Processing Section. The other side, the shading data which flows from RAM via routes ⑥ and ⑦, is input to the Image Processing Section. After finishing the draft's information image processing, white is regarded as "0" and black is regarded as "1". Then via routes ④ and ⑤, they are stored in RAM.
- (4) The white/black data stored as above is input to the P/S converter via routes ⑧ and ⑨. The white/black data converted to serial data in the P/S converter is input to the Thermal Head via route ⑩ and is printed out on recording paper.

**Note:** Standard: Reads 3.86 times/mm.  
 Fine: Reads 7.7 times/mm.  
 Super-Fine: Reads 15.4 times/mm.

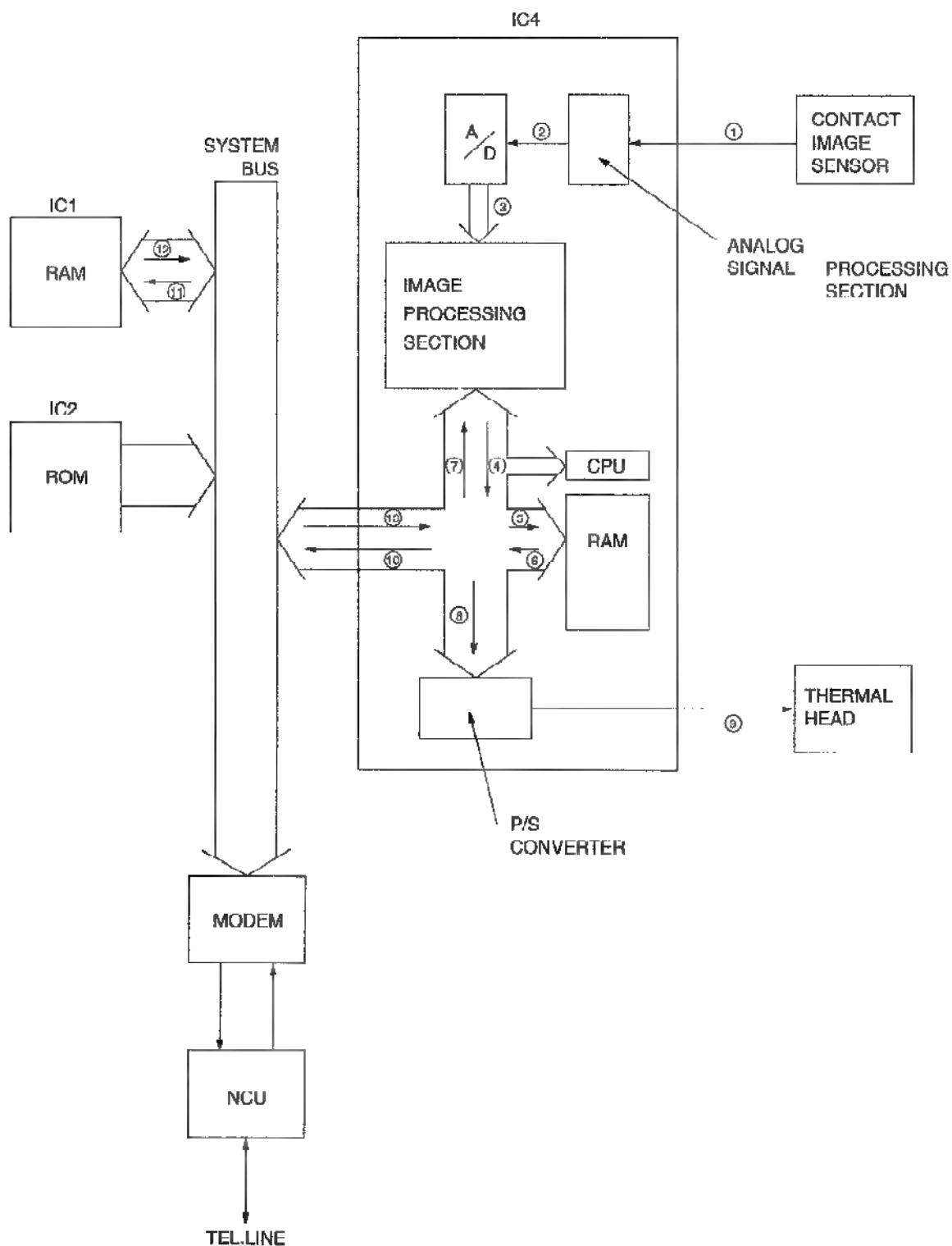
#### Transmission

- (1) Same processing as COPY items 1) - 3).
- (2) The data stored in RAM of IC4 is output from IC4 via routes ⑩ and ⑪, and is stored in the system bus. Via route ⑫, it is stored in the communication buffer inside RAM (IC1).
- (3) While fetching data stored in the communication buffer synchronous with the modem, the CPU inputs data to the modem along route ⑬. There it is converted to serial analog data and forwarded over telephone lines via the NCU Section.

#### Reception

- (1) The serial analog image data is received over telephone lines and input to the modem via the NCU section, where it is demodulated to parallel digital data. Then the CPU stores the data in the communication buffer of RAM (IC1) along route ⑭.
- (2) The data stored in RAM (IC1) is decoded by the CPU via route ⑮, and is stored in RAM by routes ⑯ and ⑰.
- (3) Same processing as COPY item 4).

Block Diagram



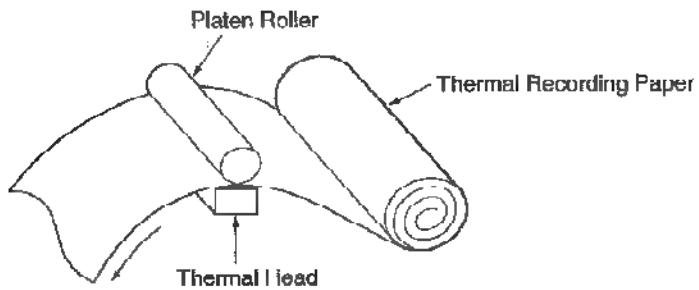
## 4-2. THERMAL HEAD

### (1) Function

This unit utilizes state of the art thermal printer technology.

The recording paper (roll paper) is chemically processed. The thermal head contacts this paper and it emits heat, according to data, momentarily, and black dots (appearing like points) are printed on the paper. As this continues, letters and/or diagrams appear, and the original document is reproduced.

### COMPOSITION OF THE RECEIVE RECORD SECTION (THERMAL RECORDING FORMAT)



### (2) Circuit Operation

There are 18 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 96 heat emitting registers. This means that one line is at a density of  $96 \times 18 = 1728$  dots = (8 dots/mm).

White/Black (white=0, black=1) data in one line increments is synchronized at IC4 pin 146 (THCLK), and sent from IC4 pin 145 (THDAT) to the shift register of the ICs. The shift registers of the 18 ICs are connected in series, and upon the shift of dot increment 1728, all the shift registers become filled with data, and a latch pulse is emitted to each IC from IC4 pin 147 (THLAT).

With this latch pulse, all the contents of the shift registers are latched to the latch registers. Thereafter, through the addition of strobes from the IC4 pins (138, 139, 140) only black dot locations (=1) among latched data activates the driver, and the current passes to heat the emitting body causing heat emission.

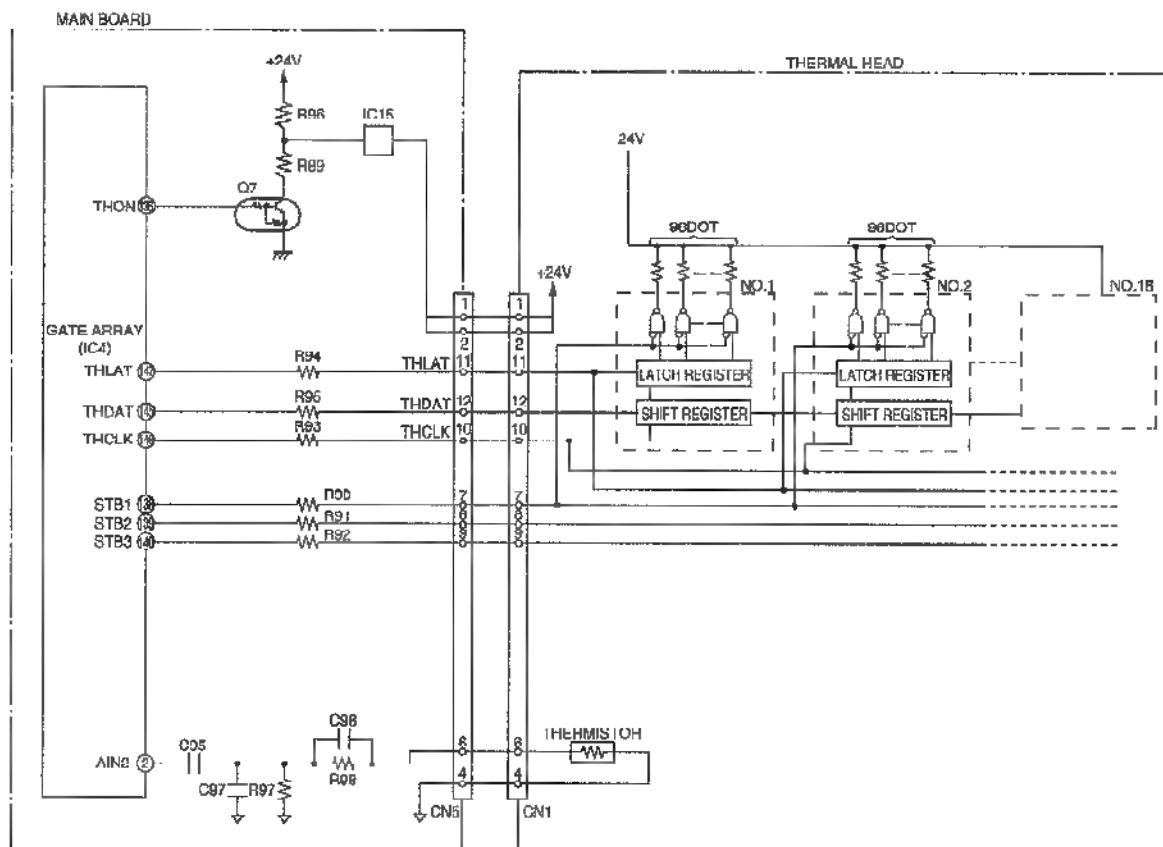
Here, the three line strobes, STB1 to STB3, impress at intervals of 9.216 msec, as required for one-line printout.

The sequence is shown on the next page. [Moreover, for the strobe width, the thermistor value inside the thermal head is detected according to IC4 pin 2. (See page 114.) Depending on that value, the strobe width is recorded in ROM (IC2). Accordingly, the strobe width is determined.

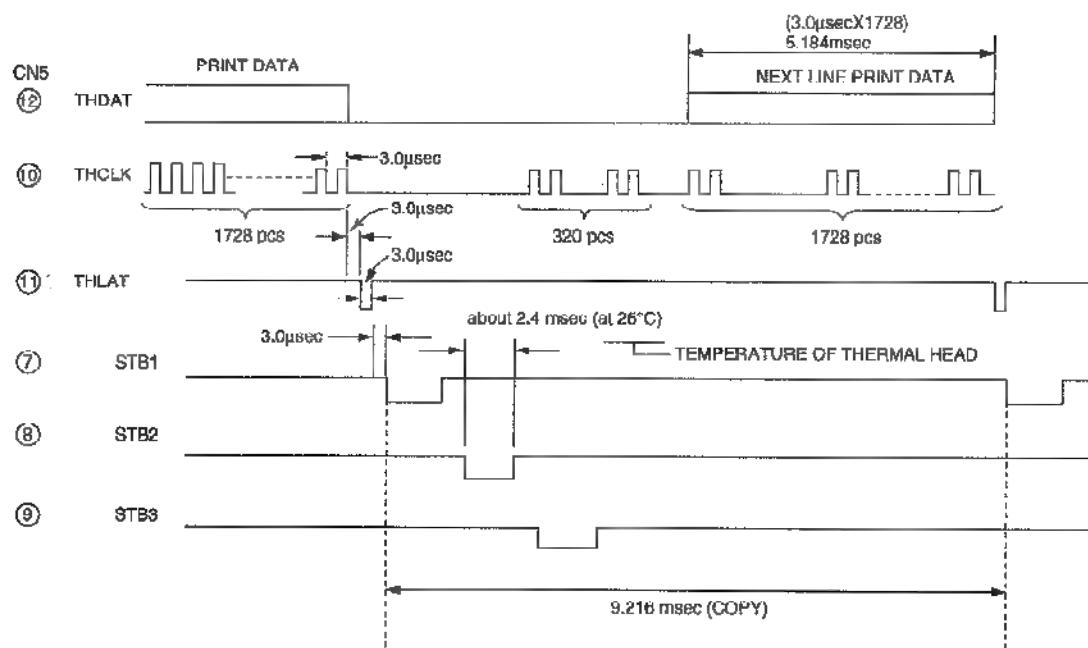
When the thermal head is not used, the IC4 (118, THON) becomes low, Q8 turns OFF, IC14 turns OFF, and the +24 V power supply for the thermal head driver is interrupted to protect the IC.

## KX-FT37AL

### Circuit Diagram

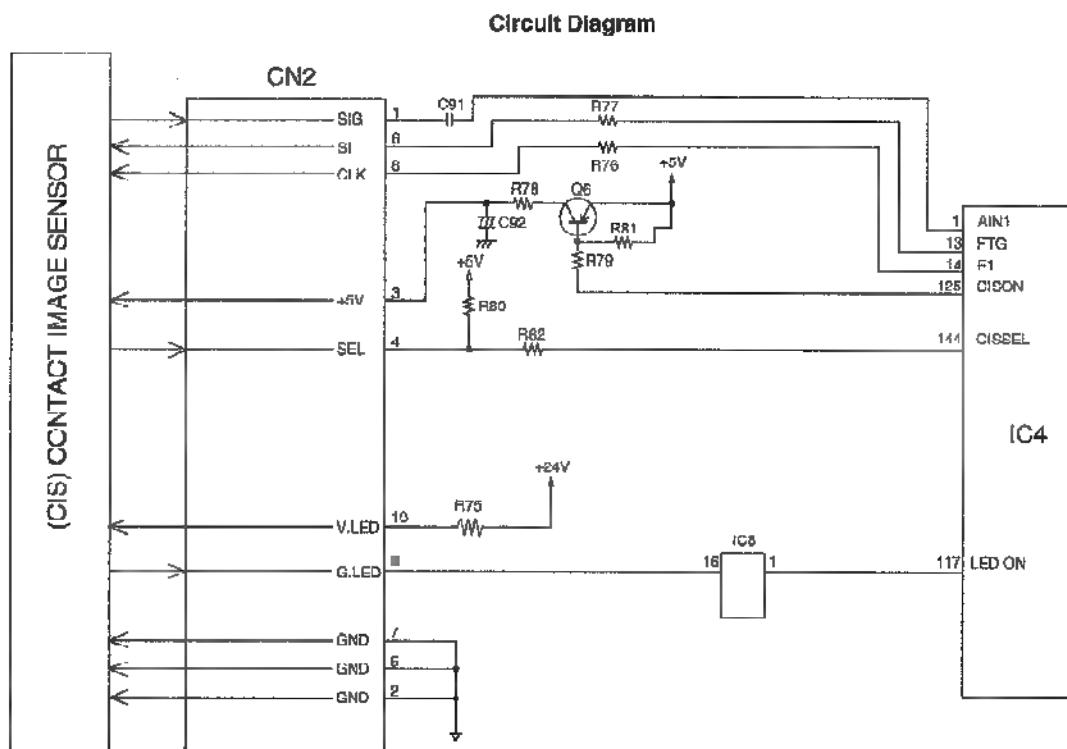


### Timing Chart



### 4-3. SCANNING BLOCK

The scanning block of this device consists of a control circuit and a contact image sensor made up of a celfoc lens array, an LED array (Page 117), and photoelectric conversion elements.



When an original document is inserted and the start button pressed, pin 117 of IC4 goes to a high level and the transistor inside IC8 turns on. This applies voltage to the LED array to light it. At the same time, pin 125 of IC4 goes to a low level and Q6 turns on to supply +5V power to the contact image sensor. The contact image sensor is driven by each of the FTG-F1 signals output from IC4, and the original image illuminated by the LED array undergoes photoelectric conversion to output an analog image signal (SIG). The analog image signal is input to the system LSI on AIN1 (pin 1 of IC4) and converted into 8-bit data by the A/D converter inside IC4. Then this signal undergoes digital processing in order to obtain a high-quality image.

## KX-FT37AL

### 4-4. STEPPING MOTOR DRIVE CIRCUIT

#### (1) Function

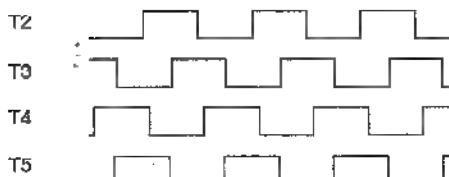
One individual stepping motor is used for transmission and reception. It feeds the document or recording paper synchronized for reading or printing.

#### (2) Circuit Operation

During motor drive, ASIC IC4 pin 130 becomes a high level, and Q8 go ON as a result. +24 V is supplied to the motor coil. Stepping pulses are output from ASIC IC4, causing driver IC8 to go ON. The motor coil is energized sequentially in 2 phase increments or 1-2 phase increments, which causes a 1-step rotation. A 1-step rotation is 0.13mm of recording paper or document paper.

The timing chart is below.

Timing Chart (2 Phase)

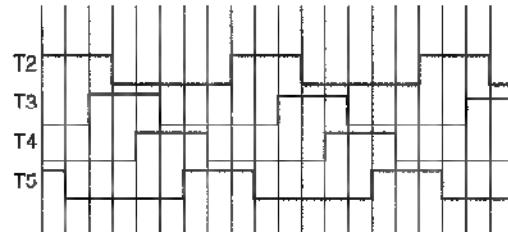
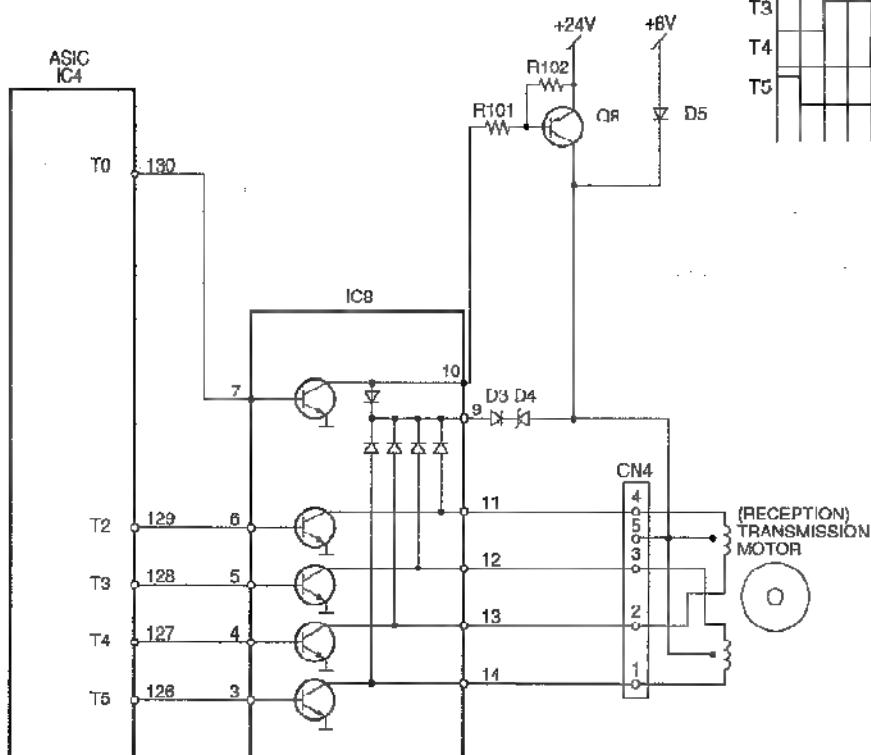


Stepping Motor Phase Pattern

Function	Mode	Drive Phase Pattern	Speed
Copy	Fine/Half Tone	1-2	217 pps
	Super Fine	1 2	108.5 pps
FAX	STD	2	217 pps
	Fine/Half Tone	1-2	217 pps
	Super Fine	1-2	108.5 pps
—	Paper Feed	1-2	434 pps

1-2. Phase (Asic IC4 T2-T5, output)

Circuit Diagram



When the motor is OFF, ASIC IC4 pin 130 becomes a low level and Q8 also turns OFF. Instead of +24V, +8V is supplied through D4 so that the motor is held in place.

## 4-5. GEAR SECTION

### (1) Function

This model provides a motor-driven mechanism for copying, printing received faxes and reading documents.

### (2) Operation (Refer to Fig. A and B)

When a motor with *Drive Motor Gear* attached rotates counterclockwise (:CCW), *Swing Gear C* will rotate around pivot point 3.

Then, G2 engages G1 and drives G8 and G4 as well as G7 to turn clockwise.

The following is an outline of how the motor mechanism works in each mode.

#### ① Transmit mode

*Swing Gear A* turns around pivot point 1. G8 engages G9 and conveys its drive power to the *Read Roller Gear* through G10 and sets the platen roller for feeding documents.

#### ② Cutter & Retraction (Reverse) mode

G8 of *Swing Gear A* disengages G9. G4 of *Swing Gear B* engages G6 and drives G11 which has the *Cutter Arm* attached. Then, the cutter blade is rotated. G11, which is partially connected to the *Outer Gear* of G11, makes a full rotation after copying/receiving are completed. In the meantime, *Outer Gear* of G11 engages the *Print Roller Gear* and makes the platen roller rotate counterclockwise. After copying/receiving are completed, the recording paper is pulled back to the printing start position. Lastly, the paper is fed to the point where the *Jam Sensor* turns on and it stops. If recording paper is stuck, the sensor does not go through the ON→OFF→ON process, so that the "Paper jam" can be detected. When starting to copy documents/receive faxes, the edge of the recording paper remaining on the sensor will be pulled back to the printing start point.

#### ③ Receive mode

G8 of *Swing gear A* disengages G9. G4 of *Swing gear B* engages G6, and conveys its drive power to the *Print Roller Gear* on the cabinet.

#### ④ Copy mode

*Swing Gear B* rotates around pivot point 2. G4 engages G6 and conveys its drive power to the *Print Roller Gear* on the cabinet and sets the platen roller for feeding recording paper. Then, G8 engages G9 and conveys its drive power to the *Read Roller Gear* through G10 and sets the platen roller for feeding documents.

The controlling positions of *Swing Gears A and B* determine which gears convey their drive power in each mode. *Swing Gears A and B* have a small protrusion in their lower end which determines the positions of the swing gears. There are grooves each protrusion can fit into inside *Upper CAM 1* for *Swing Gear A* and *Lower CAM 1* for *Swing Gear B*. (*Upper CAM 1* shown in Fig. B, which is located above *Lower CAM 1*, is not illustrated in Fig. A.) Different grooves are selected in different modes. When setting a groove's position to select a specific mode, rotate *Upper/Lower CAM 1* and indicate the mode you want to use with the *Mode Marker*. Mode options **R**, **C**, **P** and **RP** are displayed on *Upper CAM 1*. For example, if the *Mode Marker* points to **R** (Transmit mode), G8 of *Swing Gear A* engages G9, and G4 of *Swing Gear B* is fixed so it will not contact G6 and G5. Mode **C** (Retraction mode) is for starting to copy documents/receive faxes. **P** (Receive mode) is for receiving faxes. **RP** (Copy mode) is for copying documents. *Switch 1* is for detecting the **R** position by the indent in *Upper CAM 1*. Other modes are determined by how many rotations the stepping motor makes from the starting position of **R**. The motor revolving clockwise (:CW) will prompt *Swing Gear C* to rotate around pivot point 3 and engage G3 and then it will set *Upper CAM 1* to rotate clockwise.

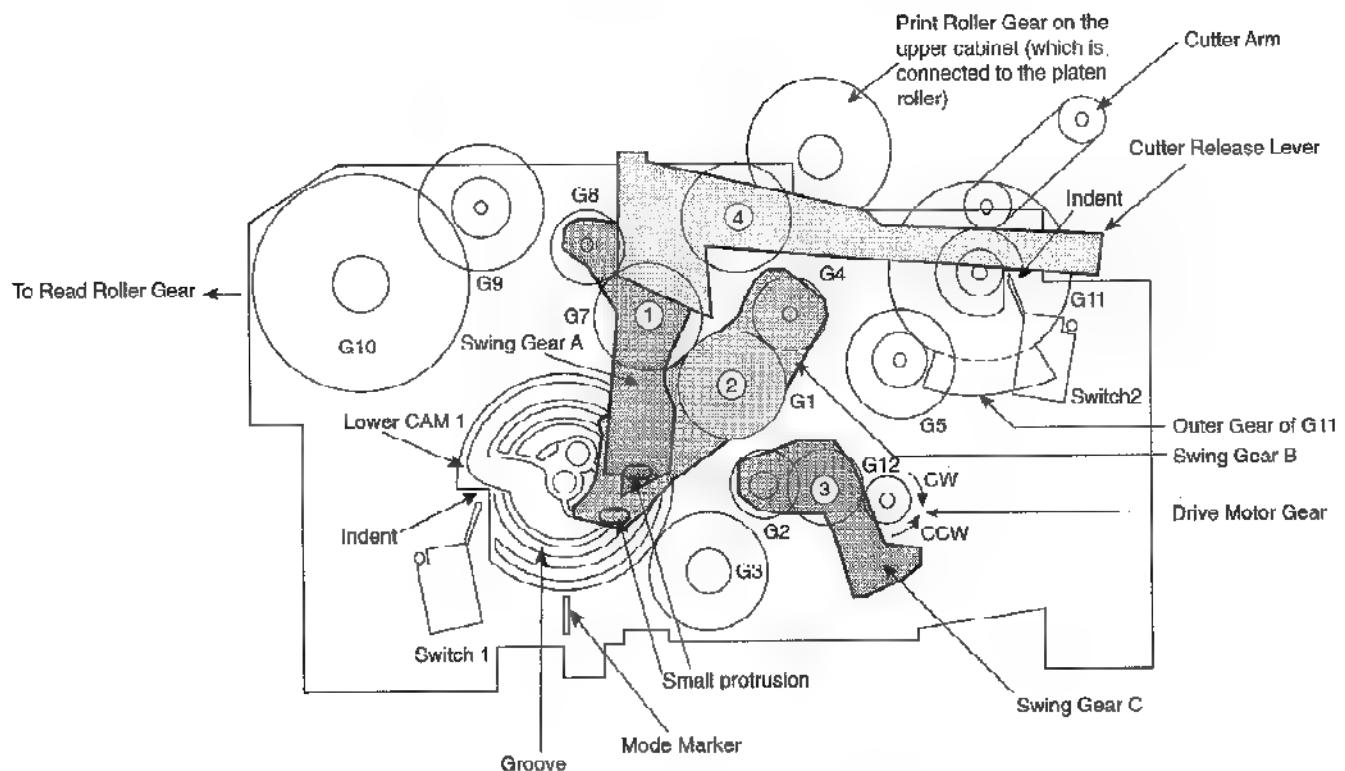
#### ⑤ SUMMARY

The *Drive Motor Gear* first rotates clockwise (:CW) to select a mode, and then the gear rotates counterclockwise (:CCW) to provide its driving force to the selected gear.

*Switch 2* is for checking the position where the cutter blade is open to the maximum (default value) and the location of the *Outer Gear* of G11. When the switch lever goes into the indent in G11, the switch is ON (initialized) and G11 makes a full turn starting from that position.

If the cutter blade is stuck due to "Paper Jam" and does not stop at the normal position, you can release the cutter blade by pushing down the *Cutter Release Lever* which pushes up the *Cutter Arm*.

This motor-driven mechanism operation in each mode is illustrated in further detail on the next page.



Note: In Fig. A, the gear above G1 is omitted here for clarity.

Fig.A

[The motor operation is in the idle mode.]

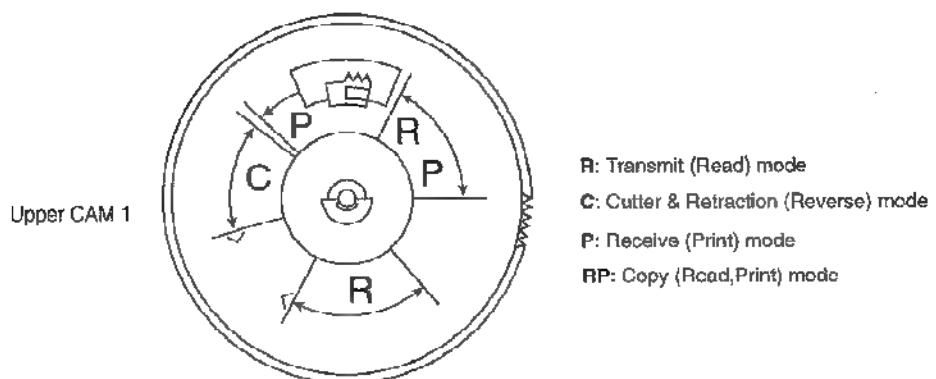
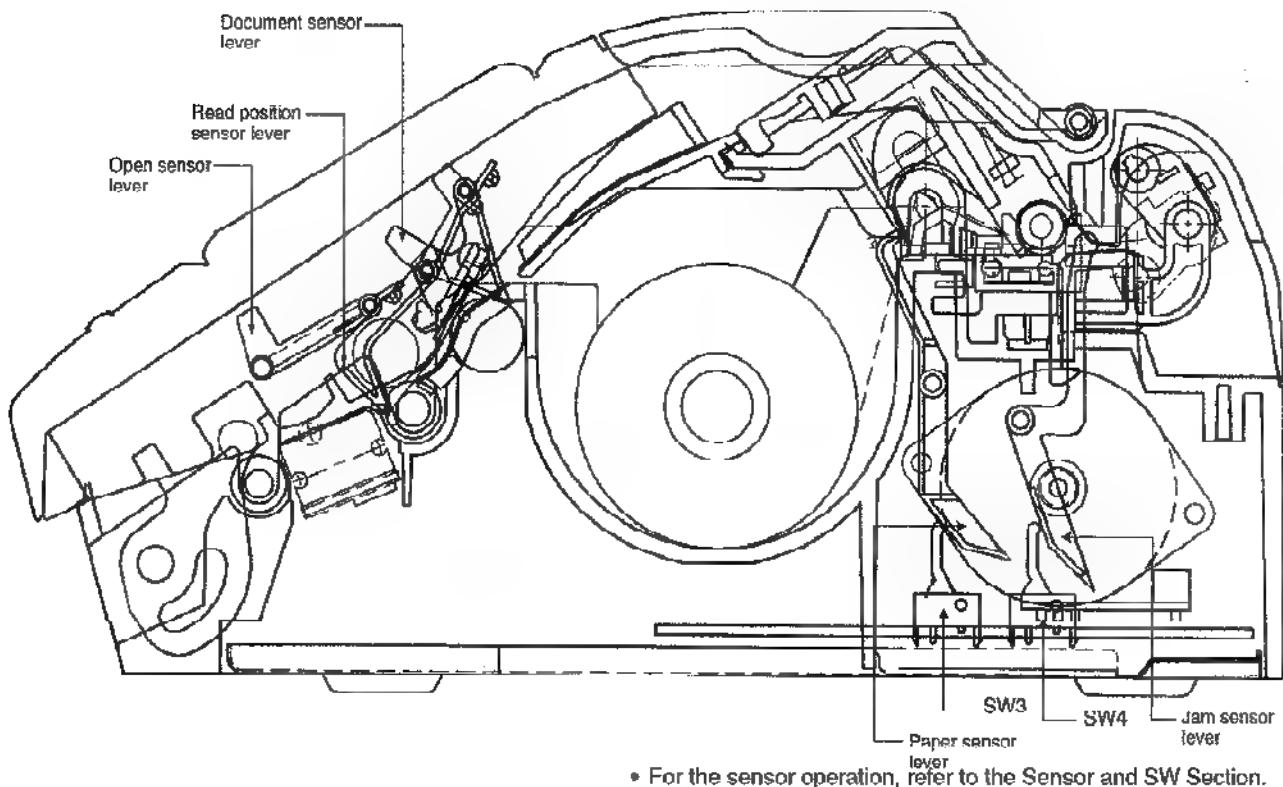
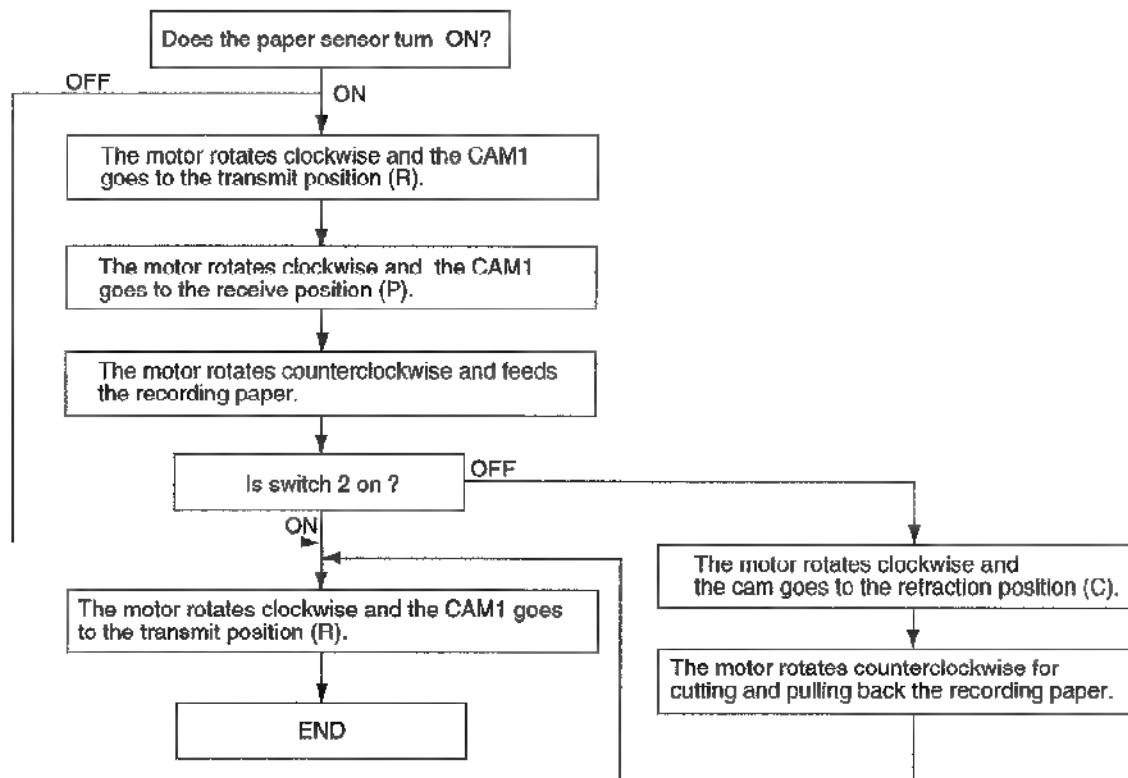


Fig.B

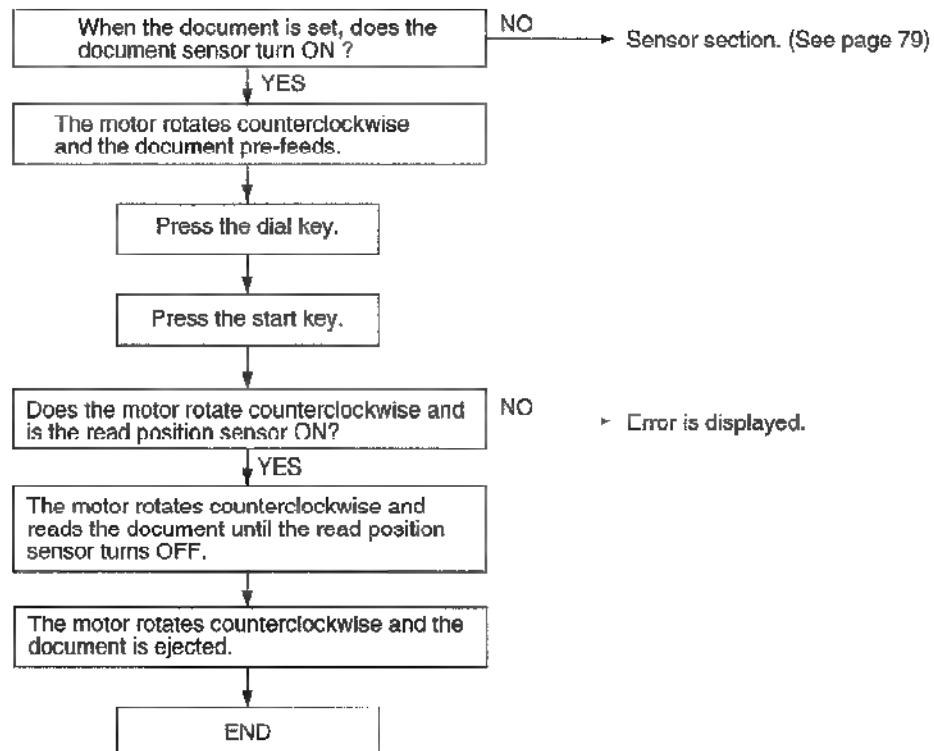


### (3)-1 Idle mode

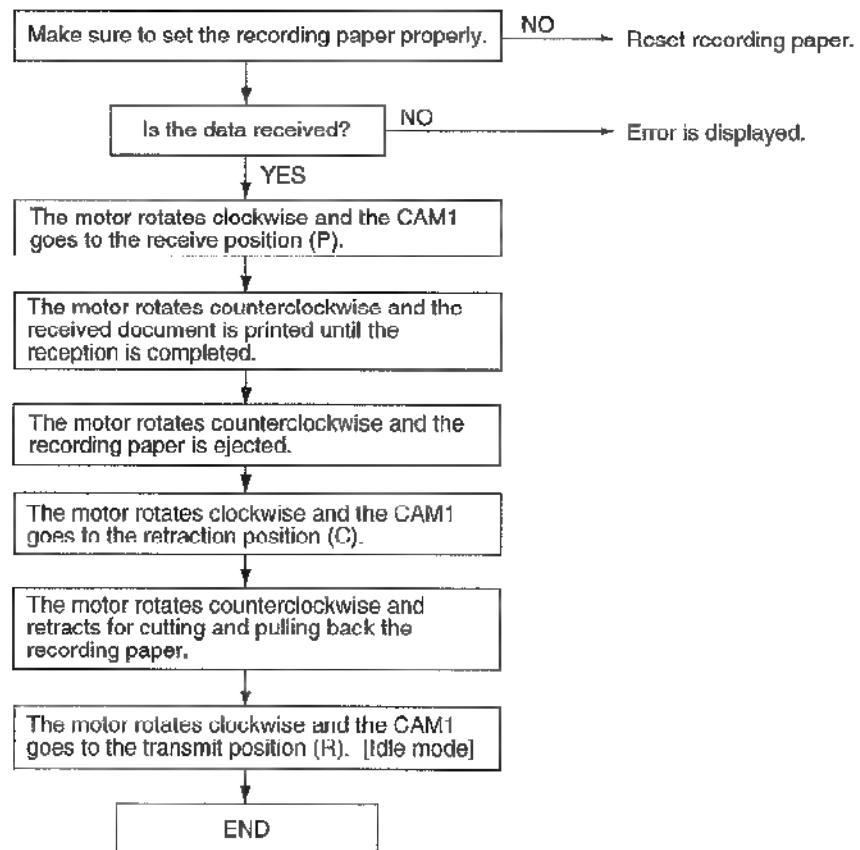
After turning on the unit, it will operate as follows:



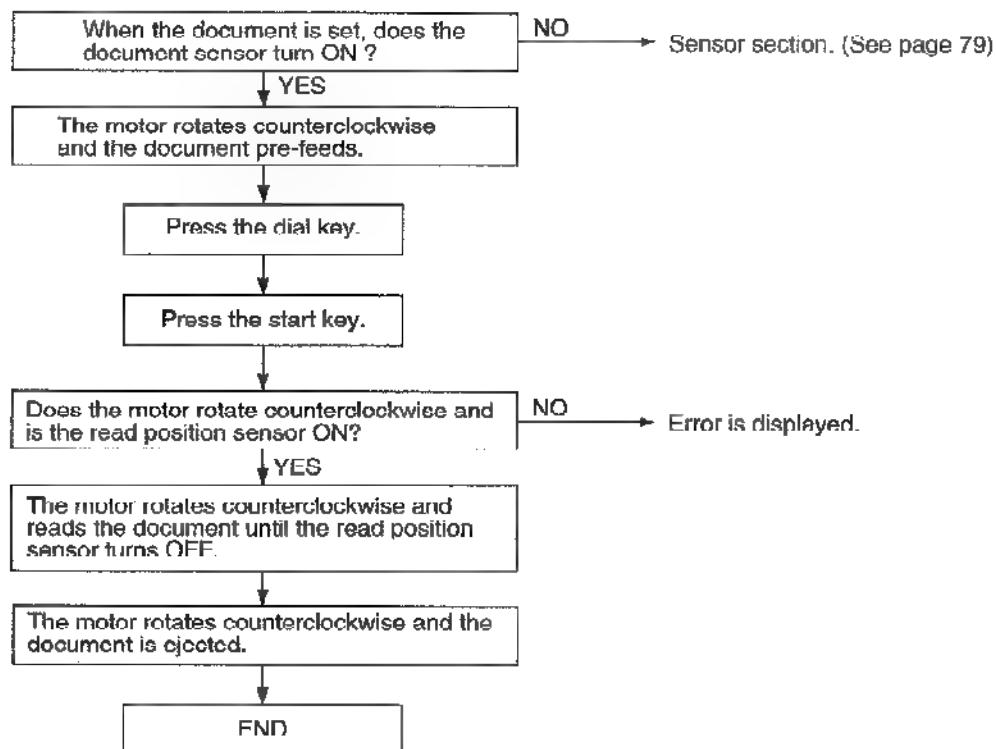
## (3)-2 Transmitting documents



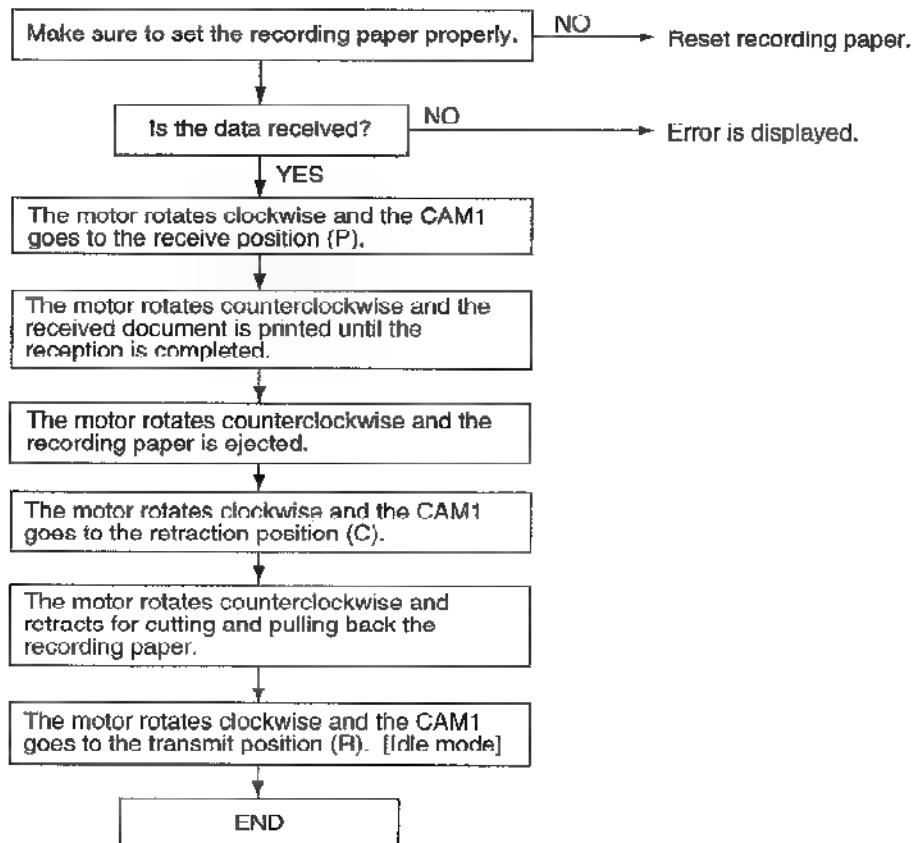
## (3)-3 Receiving FAX



## (3)-2 Transmitting documents



## (3)-3 Receiving FAX



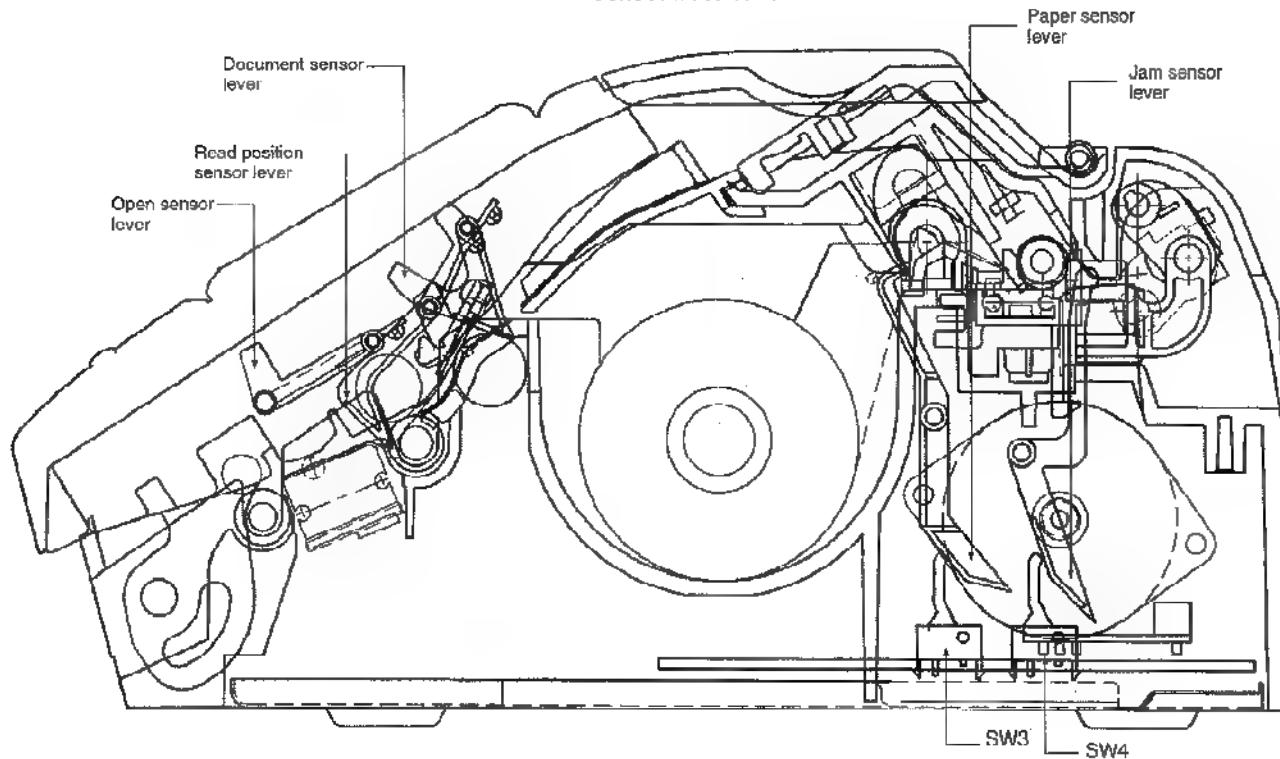
## 4.6 SENSORS AND SWITCHES

All of the sensor and switches are shown below.

Sensor Circuit Location	Sensor	Sensor or Switch name	Mainly LCD Error Sensor error message	Remark
Operation Panel	PS2	Read Position	[ REMOVE DOCUMENT ]	※
	PS1	Document	[ CHECK DOCUMENT ]	※
	PS3	Cover Open	[ CHECK COVER ]	※
	SW50	JOG sensor	-----	page 165
Analog PCB	SW3	Paper Set	[ OUT OF PAPER ]	※
	SW4	JAM	[ PAPER JAMMED ]	※
Motor Block	SW1	Motor Position	-----	page 169
	SW2	Motor Position	-----	page 169
Handset PCB	SW5	Handset switch	-----	page 166

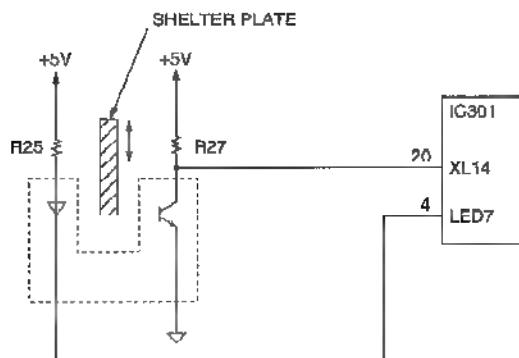
※ See the TEST FUNCTION - SENSOR CHECK SECTION for the sensor test.  
(#815 of Service Mode test Refer to page 90.)

Sensor Locations



**[Read Position Sensor (PS2)]**

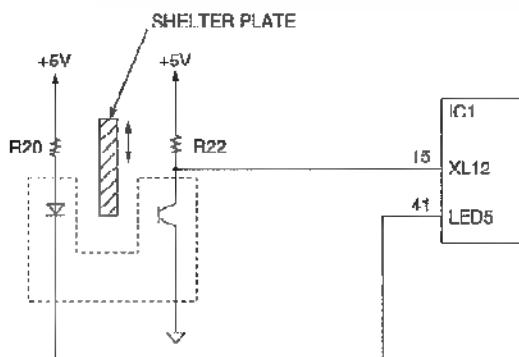
When a document is brought to the read position, the shelter plate is lifted, the phototransistor becomes ON, and the input signal of the IC1-20 pin (Operation) becomes a low level. When there is no document at the read position, the shelter plate closes the sensor light, the phototransistor becomes OFF, and the input signal of the IC1-20 pin (Operation) becomes a high level. (When checking this sensor, the IC1-4 pin becomes a low level).

**Operation Board**

	Phototransistor	Signal (IC1-20 Pin)
Out of the Read Position	OFF	High level
At the Read Position	ON	Low level

**[Document Sensor (PS1)]**

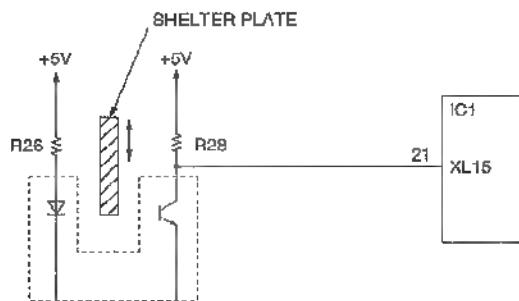
When a document is set, the shelter plate closes the sensor light, the phototransistor becomes OFF, and the input signal of the IC1-15 pin (Operation) becomes a high level. When there is no document, the shelter plate is lifted, the phototransistor becomes ON, and the input signal of the IC1-15 pin (Operation) becomes a low level. (When checking this sensor, the IC1-41 pin becomes a low level.)

**Operation Board**

	Phototransistor	Signal (IC1-15 Pin)
No document	ON	Low level
Set document	OFF	High level

**[Cover Open Sensor (PS3)]**

When the upper cabinet is closed, the shelter plate stops the sensor light and the phototransistor becomes off. The input of pin 21 of IC1 (Operation panel) becomes a high level. When the cover is opened, the sensor light passes and the phototransistor becomes on. The input of pin 21 of IC1 (Operation panel) becomes a low level.

**Operation Board**

	Phototransistor	Signal (IC1-21 Pin)
Close	OFF	High level
Open	ON	Low level

## KX-FT37AL

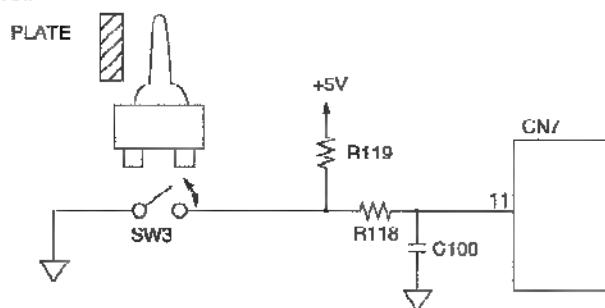
### [Recording Paper Sensor (SW3)]

When there is no recording paper, the plate is separated from the switch lever and the switch turns off.

Pin 11 of CN7 (Analog board) becomes a high level.

When there is recording paper, the plate pushes the switch lever and the switch turns ON.

Pin 11 of CN7 (Analog board) becomes a low level.



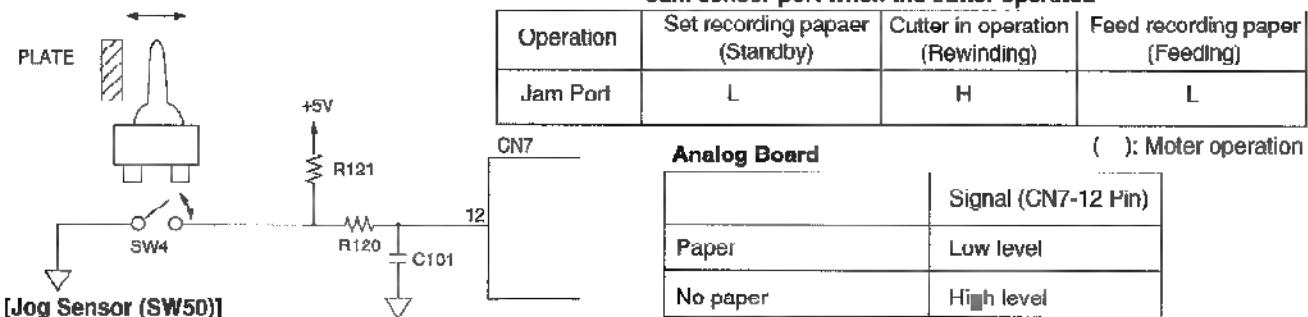
Analog Board

	Signal (CN7-11 Pin)
Paper	Low level
No paper	High level

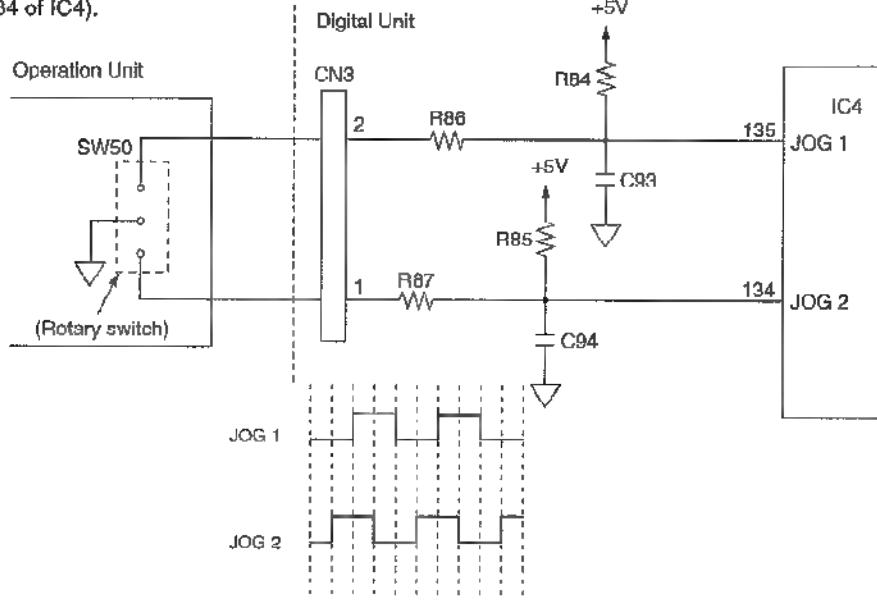
### [JAM Sensor (SW4)]

The JAM sensor is a detection switch for determining whether the recording paper edge is in the correct position or not. If the recording paper cannot be detected correctly at the JAM sensor position even when recording paper is present, then JAM is displayed. If the recording paper is at the sensor position, then the switch turns on the CN7-12 pin (Analog) switches to a low level.

Jam sensor port when the cutter operated



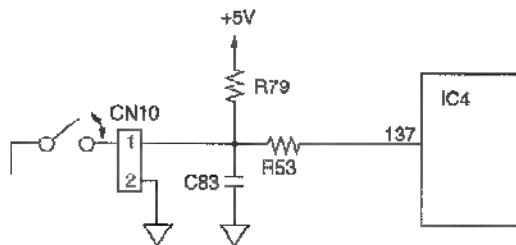
This sensor detects the speed and direction of the jog dial rotation based on variations in the potential of JOG1 (pin 135 of IC4) and JOG2 (pin 134 of IC4).



Variations in Potential During Jog Dial Rotation

**[Motor Position Sensor (Switch 1)]**

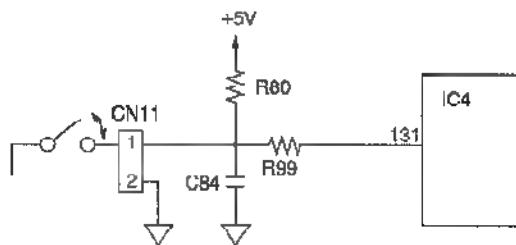
This sensor is a detection switch for recording the position of the Lower Cam 1.

**Digital Board**

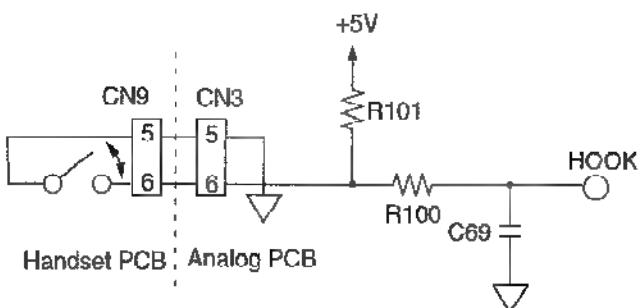
	Signal (IC4-137 Pin)
Home position	Low level
Other	High level

**[Motor Position Sensor (Switch 2)]**

This sensor is a detection switch for recording the position of the Outer Gear of G11.

**Digital Board**

	Signal (IC4-131 Pin)
Home position	Low level
Other	High level

**[Handset PCB (Switch 5)]****Analog Board**

	Signal (CN3-6 Pin)
Handset ON-HOOK	High level
Handset OFF-HOOK	Low level

## 5. MODEM SECTION

### 5-1. FUNCTION

The unit uses a 1 chip modem (IC5), enabling it to act as an interface between the control section for FAX sending and receiving, and the telephone line. During a sending operation, the digital image signals are modulated and sent to the telephone line. During a receiving operation, the analog image signals which are received via the telephone line are demodulated and converted into digital image signals. The communication format and procedures for FAX communication are standardized by ITU-T. This 1 chip modem (IC5) has hardware which sends and detects all of the necessary signals for FAX communication and DTMF.

It can be controlled by writing commands from the ASIC (IC4) to the register in the modem (IC5).

This modem (IC5) also sends DTMF signals, generates a call tone (from the speaker), and detects busy tones, dial tones and DTMF.

Overview of Facsimile Communication Procedures (ITU-T Recommendation):

#### (1) ON ITU-T (International Telecommunications' Union.)

The No. XIV Group of ITU-T, one of the four permanent organizations of the International Telecommunications Union (ITU), investigates and make recommendations on international standards for facsimiles.

#### (2) Definition of Each Group

- Group I (G1)

A-4 size documents without using formats which reduce the band width of a signal sent over telephone lines. Determined in 1968.

Transmission for about 6 minutes at scanning line density of 3.85 lines/mm.

- Group II (G2)

Using reduction technology in the modulation/demodulation format, an A-4 size document is sent at an official scanning line density of 3.85 lines/mm for about 3 minutes.

Methods to suppress redundancy are not used.

Determined in 1976.

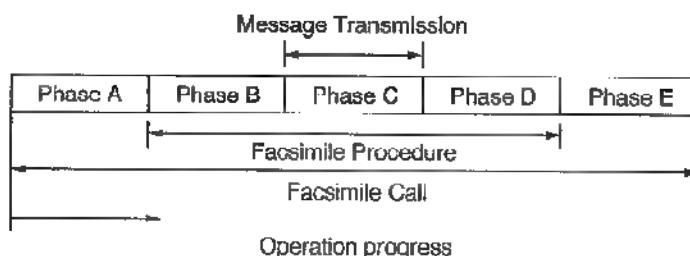
- Group III (G3)

A method of suppressing redundancy in the image signal prior to modulation is used. An A-1 size document is sent within about one minute.

Determined in 1980.

- Group IV (G4)

Transmission is via the data network. A method is provided for suppressing redundancy in signals prior to transmission,



#### Phase A : Call setting

Call setting can be manual/automatic.

#### Phase B : Pre-message procedure

Phase B is a pre-processing procedure and sequence for confirming the status of the terminal, transmission route, etc. and for terminal control. It implements the terminal preparation status, determines and displays terminal constants, confirms synchronization status, etc. and prepares for transmission of facsimile messages.

#### Phase C : Message transmission

Phase C is the procedure for transmitting facsimile messages.

#### Phase D : Post message procedure

Phase D is the procedure for confirming that the message is completed and received. For continuous transmission, phase B or phase C are repeated for transmission.

#### Phase E : Call retrieval

Phase E is the procedure for call retrieval, that is for circuit disconnection.

## (4) Concerning Transmission Time

$$\boxed{\text{Transmission Time}} = \boxed{\text{Control Time}} + \boxed{\text{Image Transmission Time}} + \boxed{\text{Hold Time}}$$

Transmission time consists of the following.

**Control time :** This is time at the start of transmission when the functions at the sending and receiving sides are confirmed, the transmission mode is established, and transmission and reception are synchronized.

**Image transmission time:**

This is the time required for the transmission of document contents (image data). In general, this time is recorded in the catalog, etc.

**Hold time:** This is the time required after the document contents have been sent to confirm that the document was in fact sent, and to check for telephone reservations and/or the existence of continuous transmission.

## (5) Facsimile Standards

Item	Telephone Network Facsimile
	G3 Machine
Connection Control Mode	Telephone Network Signal Mode
Terminal Control Mode	T. 30 Binary
Facsimile Signal Format	Digital
Modulation Mode	PSK (V. 27 ter) or QAM (V. 29)
Transmission Speed	300 bps (control Signal) 2400, 4800, 7200, 9600 bps (FAX Signal)
Redundancy Compression Process (Coding Mode)	1 dimension : MH Mode 2 dimension : MR Mode (K=2.4)
Resolution	Main Scan : 8 pel/mm Sub Scan : 3.85, 7.71/mm
Line Synchronization Signal	EOL Signal
1 Line Transmission Time [ms/line]	Depends on the degree of data reduction. Minimum Value : 10, 20 Can be recognized in 40ms.

## KX-FT37AL

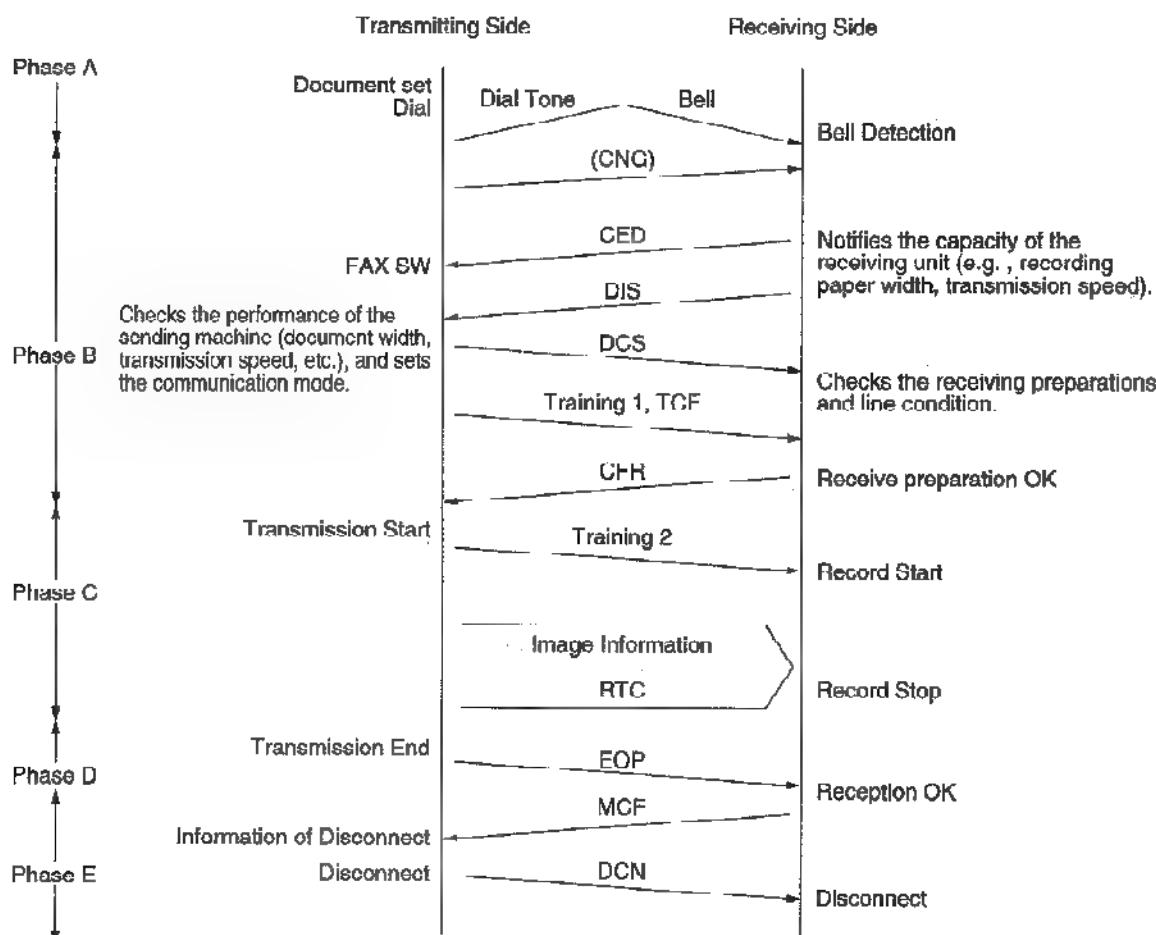
### (6) Explanation of Technology

#### ① G3 Communication Signals (T. 30 Binary Process)

For G3 facsimile communication, this is the procedure for exchanging control signals between the sending and receiving machines both before and after transmission of image signals.

Control signals at 300 bps FSK are: 1850 Hz...0, 1650Hz...1.

An example of the binary process in G3 communication is shown below.



#### Explanation of Signals

Control signals are comprised mainly of 8-bit identification signals and of the data signals added to them. Data signals are added to DIS and DCS signals.

Signal....DIS (Digital Identification Signal)

Function:

Notifies the capacity of the receiving unit.  
The added data signals are as follows.

(Example)

Bit No.	DIS/DTC	DCS
1	Transmitter - T. 2 operation	
2	Receiver - T. 2 operation	Receiver - T. 2 operation
3	T.2 IOC = 176	T. 2 IOC = 176
4	Transmitter - T. 3 operation	
5	Receiver - T. 3 operation	Receiver - T. 3 operation
6	Reserved for future T. 3 operation features.	

Bit No.	DIS/DTC	DCS
7	Reserved for future T.3 operation features.	
8	Reserved for future T.3 operation features.	
9	Transmitter - T.4 operation	
10	Receiver - T.4 operation	Receiver - T.4 operation
11, 12 (0, 0) (0, 1) (1, 0) (1, 1)	Data signaling rate V.27 ter fallback mode V.27 ter V.29 V.27 ter and V.29	Data signaling rate 2400 bit/s V.27 ter 4800 bit/s V.27 ter 9600 bit/s V.29 7200 bit/s V.29
13	Reserved for the new modulation system.	
14	Reserved for the new modulation system.	
15	Vertical resolution = 7.7 line/mm	Vertical resolution = 7.7 line/mm
16	Two-dimensional coding capability	Two-dimensional coding
17, 18 (0, 0) (0, 1) (1, 0) (1, 1)	Recording width capabilities 1728 picture elements along a scan line length of 215 mm $\pm$ 1% 1728 picture elements along a scan line length of 215 mm $\pm$ 1% and 2048 picture elements along a scan line length of 255 mm $\pm$ 1% and 2432 picture elements along a scan line length of 303 mm $\pm$ 1% 1728 picture elements along a scan line length of 215 mm $\pm$ 1% and 2048 picture elements along a scan line length of 255 mm $\pm$ 1% Invalid (See Note 7.)	Recording width 1728 picture elements along a scan line length of 215 mm $\pm$ 1% 2132 picture elements along a scan line length of 303 mm $\pm$ 1% 2048 picture elements along scan line length of 255 mm $\pm$ 1% Invalid
19, 20 (0, 0) (0, 1) (1, 0) (1, 1)	Maximum recording length capability A4 (297 mm) Unlimited A4 (297 mm) and B4 (364 mm) Invalid	Maximum recording length A4 (297 mm) Unlimited B4 (364 mm) Invalid

Signal.....DCS (Digital Command Signal)

Function:

Identification Signal Format.....X1000001

Notifies the capacity of the receiving machine obtained at DIS and announces the transmission mode of the sender. The added data signals are as follows.

Bit No.	DIS/DTC	Standard setting	DCS
21, 22, 23 (0, 0, 0) (0, 0, 1) (0, 1, 0) (1, 0, 0) (0, 1, 1) (1, 1, 0) (1, 0, 1) (1, 1, 1)	Minimum scan line time capability of the receiver 20 ms at 3.851/mm: T7.7=T3.85 40 ms at 3.851/mm: T7.7=T3.85 10 ms at 3.851/mm: T7.7=T3.85 5 ms at 3.851/mm: T7.7=T3.85 10 ms at 3.851/mm: T7.7=1/2 T3.85 20 ms at 3.851/mm: T7.7=1/2 T3.85 40 ms at 3.851/mm: T7.7=1/2 T3.85 0 ms at 3.851/mm: T7.7=T3.85		Minimum scan line time 20 ms 40 ms 10ms 5ms 10 ms at 3.851/mm: T7.7=1/2 T3.85 20 ms at 3.851/mm: T7.7=1/2 T3.85 40 ms at 3.851/mm: T7.7=1/2 T3.85 0ms

**KX-FT37AL**

Bit No.	DIS/DTC	Standard setting	DCS
24	Extend field	1	Extend field
25	2400 bit/s handshaking	0	2400 bit/s handshaking
26	Uncompressed mode	0	Uncompressed mode
27	Error correction mode	0	Error correction mode
28	Set to "0"	0	Frame size 0 = 256 octets
29	Error limiting mode	0	Error limiting mode
30	Reserved for G4 capability on PSTN	0	Reserved for G4 capability on PSTN
31	Unassigned	0	
32	Extend field	1	Extend field
33 (0)	Validity of bits 17,18 Bits 17,18 are valid	0	Recording width Recording width indicated by bits 17,18
(1)	Bits 17,18 are invalid		Recording width indicated by this field bit
34	Recording width capability of 1216 picture elements along a scan line length of 151 mm $\pm$ 1%	0	Middle 1216 elements of 1728 picture elements
35	Recording width capability of 864 picture elements along a scan line length of 107 mm $\pm$ 1%	0	Middle 864 elements of 1728 picture elements
36	Recording width capability of 1728 picture elements along a scan line length of 151 mm $\pm$ 1%	0	Invalid
37	Recording width capability of 1728 picture elements along a scan line length of 107 mm $\pm$ 1%	0	Invalid
38	Reserved for future recording width capabilities.	0	
39	Reserved for future recording width capabilities.	0	
40	Extend field	1	Extend field
41	Semi super time / mm	1	
42	Semi super time / inch	0	
43	Super time	0	
44	inch	0	
45	mm	1	
46	MSC/SF	0	
47	Select polling	0	
48	EXT	0	

Note 1 - Standard facsimile units conforming to T.2 must have the following capability : Index of cooperation (IOC)=264.

Note 2 - Standard facsimile units conforming to T.3 must have the following capability : Index of cooperation (IOC)=264.

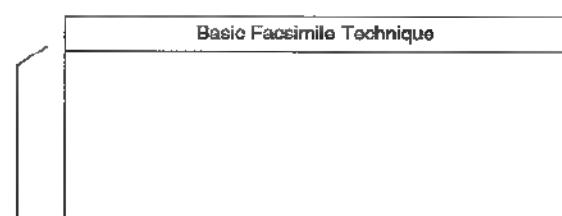
Note 1 - Standard facsimile units conforming to T.4 must have the following capability : Paper length=297 mm.

Signal	Identification Signal Format	Function
Training 1	_____	A fixed pattern is transmitted to the receiving side at a speed (2400 to 9600 bps) designated by DCS, and the receiving side optimizes the automatic equalizer, etc., according to this signal.
TCF (Training Check)	_____	Sends 0 continuously for 1.5 seconds at the same speed as the training signal.
CFR (Confirmation to Receive)	X0100001	Notifies the sending side that TCF has been properly received. If TCF is not properly received, FTT (Failure To Train) X0100010 is relayed to the sender. The sender then reduces the transmission speed by one stage and initiates training once again.
Training 2	_____	Used for reconfirming the receiving side like training 1.

Signal	Identification Signal Format	Function
Image Signal	Refer to the next page.	—
RTC (Return to Control)	—	Sends 12 bits (0..01 × 6 times) to the receiver at the same speed as the image signal and notifies completion of the first sheet.
EOP (End of Procedure)	X1110100	End of one communication
MCF (Message Confirmation)	X0110001	End of 1 page reception
DCN (Disconnect)	X1011111	Phase E starts.
MPS (Multi-Page Signal)	X1110010	Completion of transmission of 1 page. If there are still more documents to be sent, they are output instead of EOP. After MCF reception, the sender transmits an image signal of the second sheet.
PRI-EOP (Procedural Interrupt-EOP)	X1111100	If there is an operator call from the sender, it will output after RTC.
PIP (Procedural Interrupt Positive)	X0110101	This is output when an operator call is received.

② Redundancy Compression Process Coding Mode  
This unit uses one-dimensional MH format.

(a) Document



(b) Part of document



(c) Run length and image signals equivalent to (b)

(d) Codification of (c) according to MH formula

11 0100111 000101 000011 10  
(Black 2) (White 18) (Black 8) (White 13) (Black 3)

Modified Huffman (MH) Code		
Run length	Code for White Line	Code for Black Line
0	00110101	00011011
1	000111	010
2	0111	11
3	1000	10
4	1011	011
5	1100	0011
6	1110	0010
7	1111	00011
8	10011	000101
9	10100	000100
10	00111	0000100
11	01000	0000101
12	001000	0000111
13	000011	00000100
14	110100	00000111
15	110101	00001100
16	101010	000001011
17	101011	000001000
18	010011	0000001000

(c) Total bit number before MH codification (497 bit)  
(d) Total bit number after MH codification (63 bit)

## 5-2. MODEM CIRCUIT OPERATION

The modem (IC5) has all the hardware satisfying the ITU-T standards mentioned previously. When the gate array IC4 (63) is brought to a low level, the modem (IC5) is chip-selected and the resistors inside IC are selected by the select signals from ASIC (IC4) A0-A4. The commands are written through the data bus, and all the processing is controlled by the ASIC (IC4) according to ITU-T procedures. The INT signal dispatched from IRQ (pin 58 of IC5) to ASIC (IC4) when the transmission data is accepted and the received data is demodulated, the ASIC (IC4) implements post processing. This modem (IC5) has an automatic application equalizer. With training signal 1 or 2 during G3 reception, it can automatically establish the optimum equalizer. The modem (IC5) operates using the 53.76 MHz clock (X3) obtained from pin 62 of ASIC (IC4).

### (1) Facsimile Transmission/DTMF Line Send (FAX TX)

The digital image data on the data bus is modulated in the modem (IC5), and sent from pin 28, 29 via amplifier IC12 and the NCU section to the telephone line.

(Signal path)...Refer to page 69.

### (2) Facsimile Reception (FAX RX)

The analog image data which is received from the telephone line passes through the NCU section and enters pin 45 of the modem (IC5). The signals that enter pin 38 of the modem (IC5) are demodulated in the board to digital image signals, then placed on the data bus.

In this case, the image signals from the telephone line are transmitted serially. Hence, they are placed on the bus in 8 bit units. Here, the internal equalizer circuit reduces the image signals to a long-distance receiving level.

This is designed to correct the characteristics of the frequency band centered about 3 kHz and maintain a constant receiving sensitivity. It can be set in the service mode.

(Signal path)...Refer to page 69.

### (3) DTMF Transmission (DTMF MONITOR SP-PHONE)

The DTMF signal generated in the modem (IC5) is output from pin 28, 29, and is then sent to the circuit on the same route as used for facsimile transmission.

(Signal path)...Refer to page 69.

### (4) Call Tone Transmission (Ringing)

This is the call signal which is generated in the ASIC (IC4) and sent to the speaker.

(Signal path)...Refer to page 70.

### (5) Busy/Dial Tone Detection

The path is the same as FAX receiving. When 1 is detected, the carrier detect bit of the resistor in the modem (IC5) becomes 1, and this status is monitored by the ASIC (IC4).

### (6) Caller ID signal receiving circuit

It is detection the Caller ID signal which is came from the telephone line.

(Signal Path)...Refer to page 70.

## 6. DESCRIPTION OF BLOCK DIAGRAM IN ANALOG SECTION

### (1) Function

The analog section is composed of the following circuits.

- ① Interface circuit to connect with telephone line (NCU)
- ② Analog gate array (IC1)
  - (1) To change the circuit configuration for Tx/Rx signals of speaker phone, Tx/Rx signals of handset, and fax signals.
  - (2) Adjust volume of speaker.
  - (3) Control other circuits such as NCU.
  - (4) Read information sent from sensors and NCU.

Following is the detailed description of each circuit.

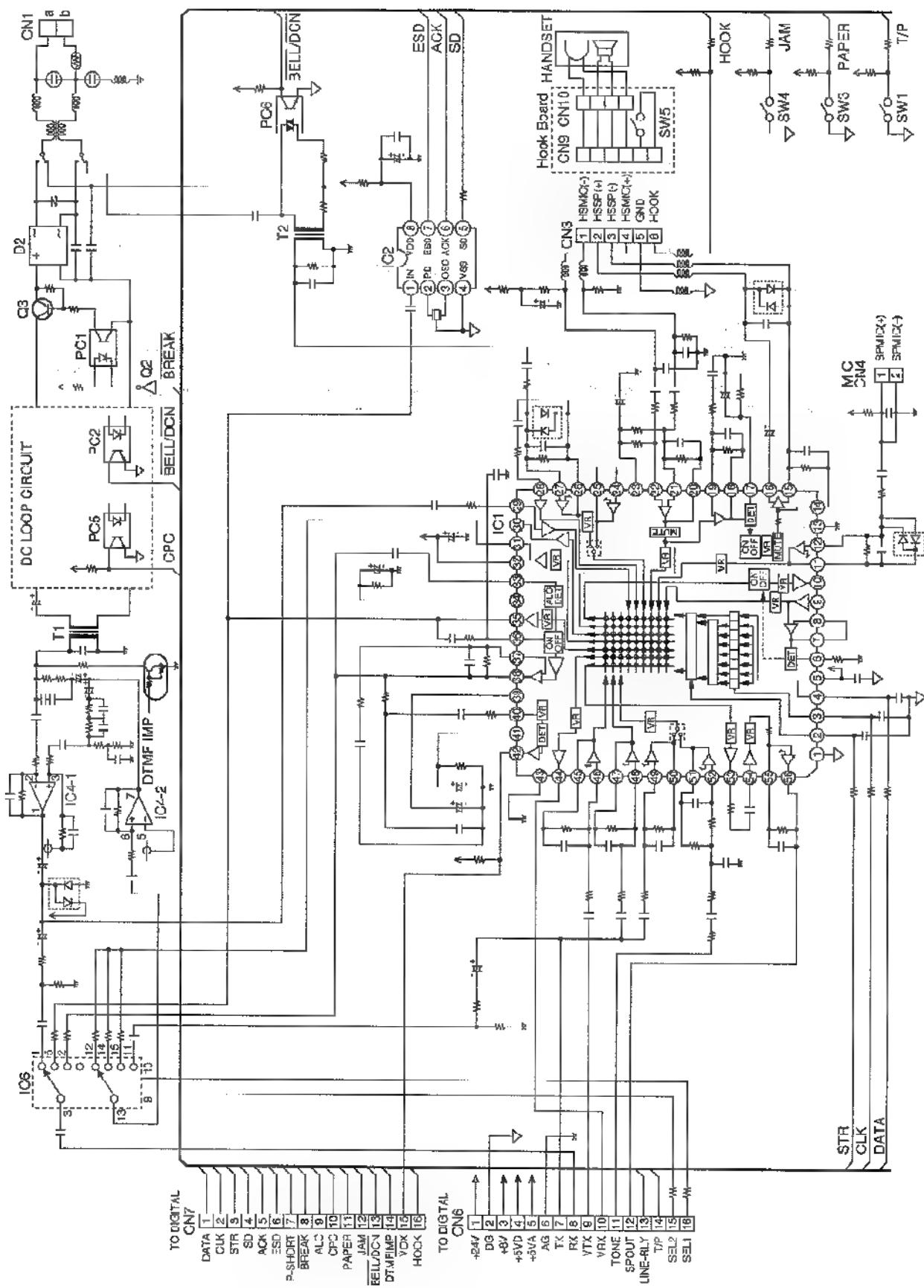
#### [NCU]:Network Control Unit

The NCU comprises of the following; DC loop forming circuit to connect with the telephone line; Switching circuit for other interconnected telephones; Bell detection circuit; Pulse dial generation circuit; Extension line phone off-hook detection circuit; Sidetone circuit; Remote fax activation circuit. Refer to page 141 for the details.

#### [Analog gate array (IC1)]

The cross-point switch installed in this IC makes it possible to change the circuit configuration for any analog signals such as the fax signals sent from the digital MODEM board or the Tx/Rx signals for speaker phone. In addition, this analog gate array integrates a handset circuit, signal level adjusting circuit, ALC (Auto level controller) circuit, electronic volume, input/output ports, etc. This IC is controlled by ASIC (IC5) on the digital board.

## Analog Unit Block Diagram



## 7. NCU Section

### 7-1. GENERAL

This section is the interface with the telephone line, and this composed of remote FAX activation circuit, bell detection circuit, pulse dial circuit, CPC detection circuit, line amplifier and sidetone circuit and multiplexer.

### 7-2. REMOTE FAX ACTIVATION CIRCUIT

#### (1) Circuit Operation

After detecting the bell signal, another telephone connected to same line activate the set to FAX mode by using DTMF signal.

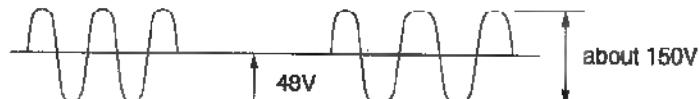
TEL LINE → RLY1 → T2 → C50 → R69 → IC1(27→35) → C61 → IC2(1)

### 7-3. BELL DETECTION CIRCUIT

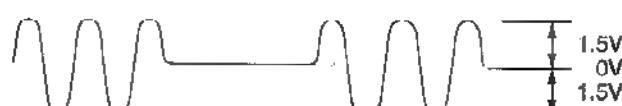
#### (1) Circuit Operation

The signal waveform for each section is indicated below. The signal (low level section) input to pin 31 of ASIC IC4 on the digital board is read.

Between the Tip and Ring



Between PC6(1) and (2)



PC6(4)/ASIC IC4(31)



TEL LINE → PC6(1, 2→4) → CN4(13) - {CN7(13)→ IC4(31)}: Bell

### 7-4. PULSE DIAL CIRCUIT AND ON/OFF HOOK CIRCUIT

#### (1) Circuit Operation

While OFF-HOOK, Q2 is ON. The photocoupler PC1 pin (2) is a low level by IC4 pin (26) and PC1 (3) and (4) are shorted. During a pulse dial operation, PC1 pin (2) becomes a high level by IC4 pin (26), so that PC1 pin (3) and (4) are opened. The line turns OFF. ON/OFF, controlled by IC4 pin (26), makes the pulse dial operation possible.

{IC4 (26)} Break Low Level → CN7 (8) → Q2 OFF → PC1 (2) High level → PC1 (3)(4) OFF:DC Loop OFF (ON HOOK Status)

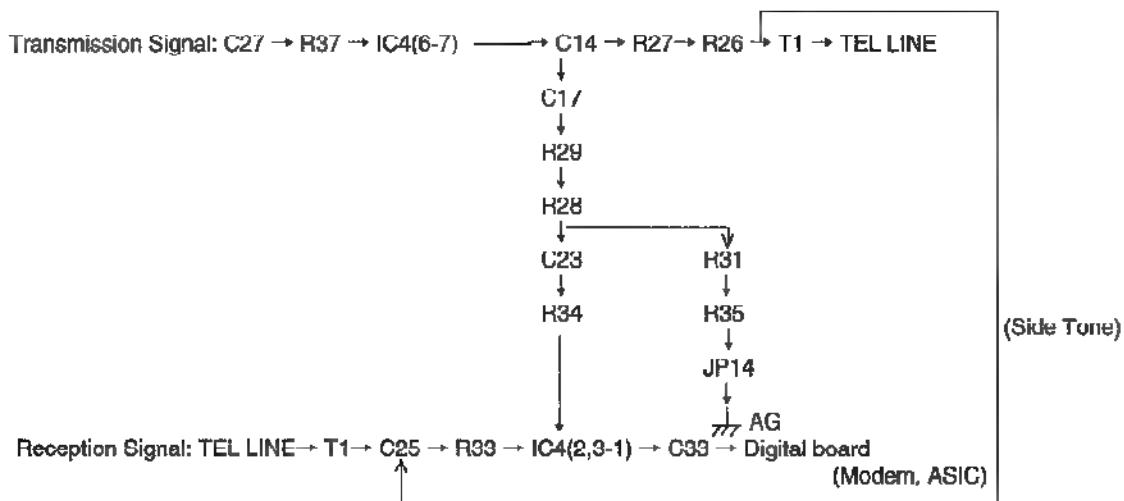
{IC4 (26)} Break High Level → CN7 (8) → Q2 ON → PC1 (2) Low level → PC1 (3)(4) ON:DC Loop ON (OFF HOOK Status)

## 7-5. LINE AMPLIFIER AND SIDE TONE CIRCUITS

### (1) Circuit Operation

The reception signal received as output from line transformer T1 is given as input to C25, R33 and IC1 pin (2). Then it is input to the reception system at an amplifier gain of 5.9 dB from pin 1.

The transmission signal given as input to IC4 pin (6) via R37, and C27 is amplified to about 16.5 dB. It is output from pin 7 of IC4 and is transmitted to T1 via C14, R26 and T1. Without a side tone circuit, the transmission signal would return to the reception amplifier via R26 and C14. Here, the signal output from IC4 pin (7) passes through C17, R28, R34 and C23 and enters the amplifier IC4 pin (3). This is used to cancel the return portion of the transmission signal. This is the side tone circuit.



## 7-6. AUTO DISCONNECT CIRCUIT

### (1) Function

This circuit used to detect that the telephone connected in parallel to the same line is OFF-hook while the unit picks up the line. If this detection circuit is activated when TAM is being recorded, the recording stops and the circuit is automatically released.

## (2) Circuit Operation

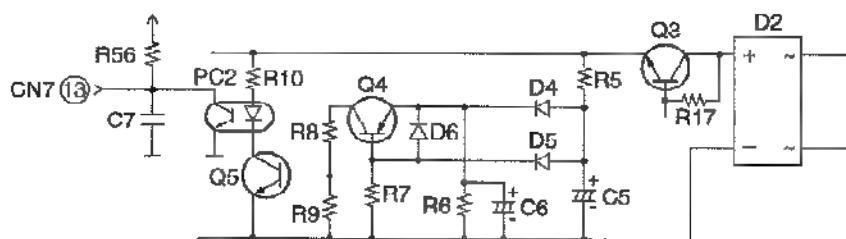
If the line is picked up, C5 is charged by following the path shown below.

D2(+) → Q3 → R5 → D4 → C6

When the electric potential difference between the base and emitter of Q4 becomes less than about 0.3V, Q4 and Q5 and PC2 turn off, then the CN7(13) becomes a high level.

In this condition, if a telephone connected in parallel goes into OFF-hook status, the base of Q4 becomes low.

On the other hand, the emitter of Q4 goes down because the capacitor (C6) is charged. Q4 turns on when the electric potential difference between the base and emitter of Q4 becomes more than 0.6V while being charged. When Q4 turns on, Q5 and PC 2 also turn on, then the CN7(13) becomes a low level.



## 8. ITS (Integrated telephone System) and MONITOR SECTION

### 8.1. GENERAL

The general ITS operation is executed by the special IC1. This IC has handset circuit in 1 chip. The alarm tone, the key tone, and the beep are outputted from the ASIC IC4 (digital board). At the time of pulse dial operation, the monitor tone passes through the ASIC IC1.

## 8.2 SPEAKER PHONE CIRCUIT

### 1) Function

The circuit controls the digital filtering of the transmitted and received signals, to and from the telephone line, when the unit is used in the hands-free mode for full duplex operation.

### 2) Circuit Operation

The speakerphone can provide duplex operation.

### 3) Signal path

Refer to page 69.

## 8.3 HANDSET CIRCUIT

### 1) Function

This circuit is for conversation of Handset; transmission and reception of the voice via Handset.

### 2) Signal path

Refer to page 69.

## 8.4 MONITOR CIRCUIT FOR EACH SIGNALS

### 1) Function

This circuit is for monitoring of various tone, such as ① DTMF tone, ② Alarm/Beep/Key tone/Bell ③ Dummy ring back tone

### 2) Signal path

Refer to pages 69 and 70.

## 9. ATAS (Automatic Telephone Answering System) SECTION

### 1) Function

The ATAS main operation is executed by the special IC5 (MODEM) and IC6 (CODEC), IC7 (FLASH MEMORY) control signals are input from ASIC IC1.

- ① Greeting/Message Recording
- ② ICM Recording
- ③ Greeting/Message/ICM play to speaker
- ④ Greeting/Message/ICM play to Tel Line
- ⑤ Vox Detection : The VOX detection detects if there is a signal or voice on the line.  
The VOX circuit reacts to the OGM and ICM from the other party.

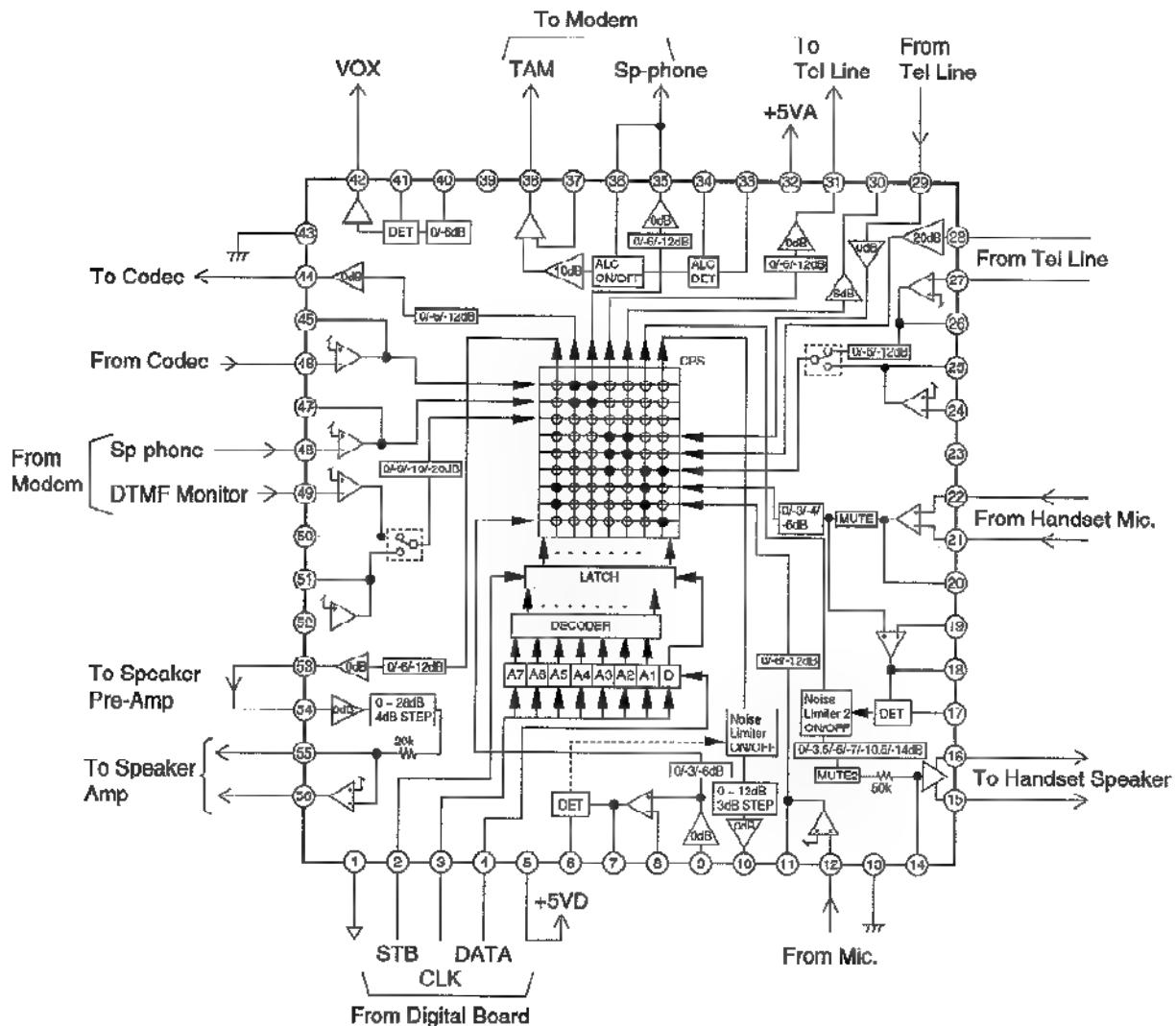
### 2) Signal Path

Refer to pages 69 and 70.

## 10. ANALOG GATE ARRAY (IC1 on the Analog Board)

This IC can perform signal route switching and level adjustments for various types of analog signals. This IC incorporates a cross-point switch (CPS), electronic volume, auto level controller (ALC) circuit for recording, attenuation circuit. The C.P.S. of this IC is controlled by sending data from digital board.

### 10.1 Internal Connections



## KX-FT37AL

### 10-2. EXPLANATION OF ANALOG GATE ARRAY (IC5 on the Analog Board)

No.	Name	Function	No.	Name	Function
1	D-GND	Digital ground	29	LINEIN	Line amp input
2	STR	Strobe input	30	DHOUT	Not used
3	CLOCK	Clock input	31	LINEOUT	Line amp output
4	DATA	Data input	32	VCC	Analog power supply
5	VDD	Logic power supply	33	ALCIN	ALC input
6	NL1DET	Noise 1 detection adjustment	34	ALCDET	ALC detection adjustment
7	NL1OUT	Noise 1 amp output	35	PROUT2	Preamp output 2
8	NL1IN	Not used	36	RECIN	Record input
9	CLIN	Not used	37	RECPIN	Record preamp input
10	CLOUD	Not used	38	RECPROUT	Record preamp output
11	MICOUT	Mic amp output	39	VREF2	Internal reference voltage output
12	MICIN	Mic amp input	40	VOXIN	VOX input
13	GND	Analog ground	41	VOXDET	VOX detection adjustment
14	RIN	HS receiver amp input	42	VOXOUT	VOX output
15	ROUT1	HS receiver amp output 1	43	GND2	Analog ground
16	ROUT2	HS receiver amp output 2	44	LSRXOUT	LS RX amp output
17	NI 2DET	Noise 2 detection adjustment	45	LSTXOUT	LS TX amp output
18	NL2OUT	Noise 2 amp output	46	LSTXIN	LS TX amp inverting input
19	NL2IN	Noise 2 amp input	47	PLYOUT	Playback amp output
20	HSMICOUT	HS mic amp output	48	PLYIN	Playback amp inverting input
21	HSMIC-	HS mic amp - input	49	TONE1IN	Tone 1 amp input
22	HSMIC+	HS mic amp + input	50	TONE1OUT	Tone 1 amp output
23	VREF1	Analog internal reference voltage	51	TONE2OUT	Tone 2 amp output
24	CIDIN	CID amp input	52	TONE2IN	Tone 2 amp input
25	CIDOUT	CID amp output	53	PROUT1	Preamp output 1
26	EXTOUT	EXT amp output	54	SPPRIN	Speaker preamp input
27	EXTIN	EXT amp inverting input	55	SPIN	Speaker amp input
28	DHIN	Caller input	56	SPOUT	Speaker amp output

## 11. OPERATION BOARD SECTION

The unit consists of LCD (Liquid crystal display), KEYS and LEDs (light-emitting diode). They are controlled by the Gate Array (IC1) and ASIC (IC4: on the DIGITAL BOARD). (Fig.a)  
The key matrix table is shown below.

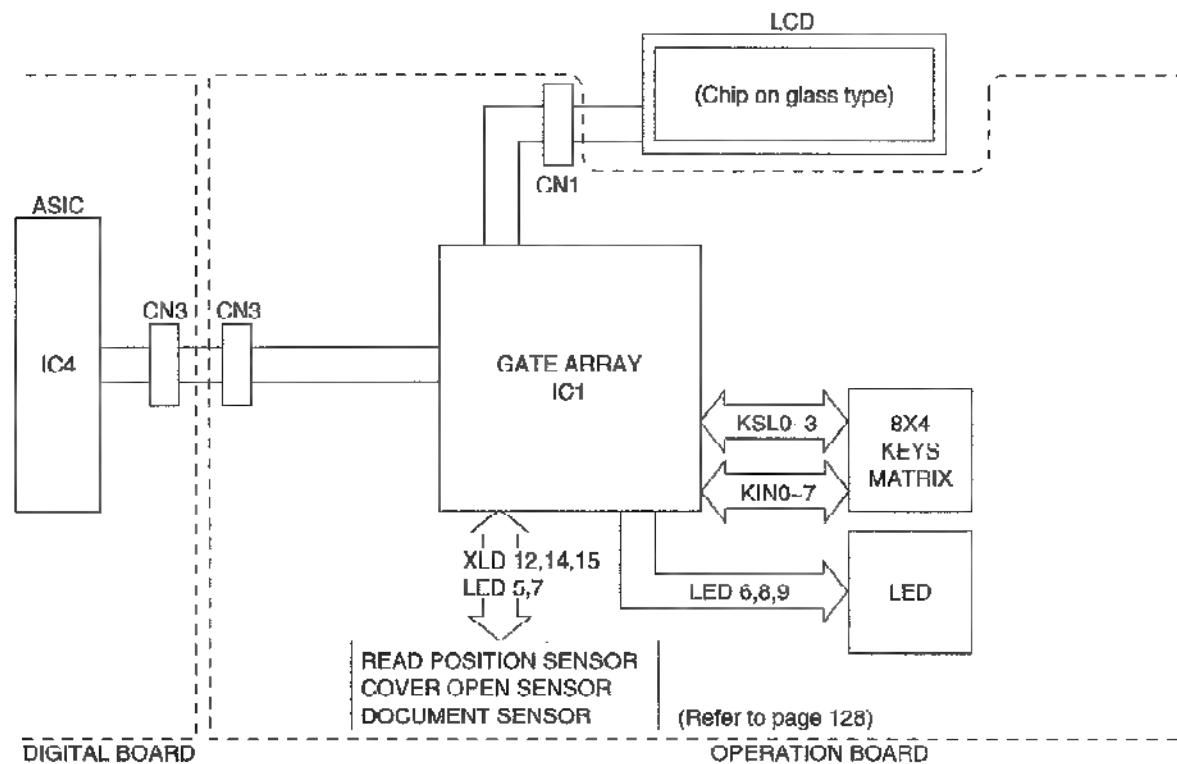


Fig. a.

Key Matrix

	KIN 0	KIN 1	KIN 2	KIN 3	KIN 4	KIN 5	KIN 6	KIN 7
O				*	7	4	1	2
KSL0		REDIAL/ PAUSE (SW25)	RECALL (SW21)	(SW17)	(SW13)	(SW9)	(SW5)	(SW1)
KSL1		# (SW26)	0 (SW22)	9 (SW18)	8 (SW14)	6 (SW10)	5 (SW6)	3 (SW2)
KSL2	SET/START /COPY (SW29)	MUTE (SW27)	MONITOR (SW23)	VOLUME V (SW19)	VOLUME A (SW15)	ERASE (SW11)	PLAY (SW7)	AUTO RECEIVE (SW3)
KSL3	STOP (SW30)	HELP (SW28)	MENU (SW24)	RECORD (SW16)			DIRECTORY EDIT (SW8)	RESOLUTION (SW4)

LED

( )...Ref. No of operation Board

	LED6	LED9	LED8
	LED6 SP-PHONE	LED9 PLAY MESSAGE	LED8 AUTO RECEIVE

## KX-FT37AL

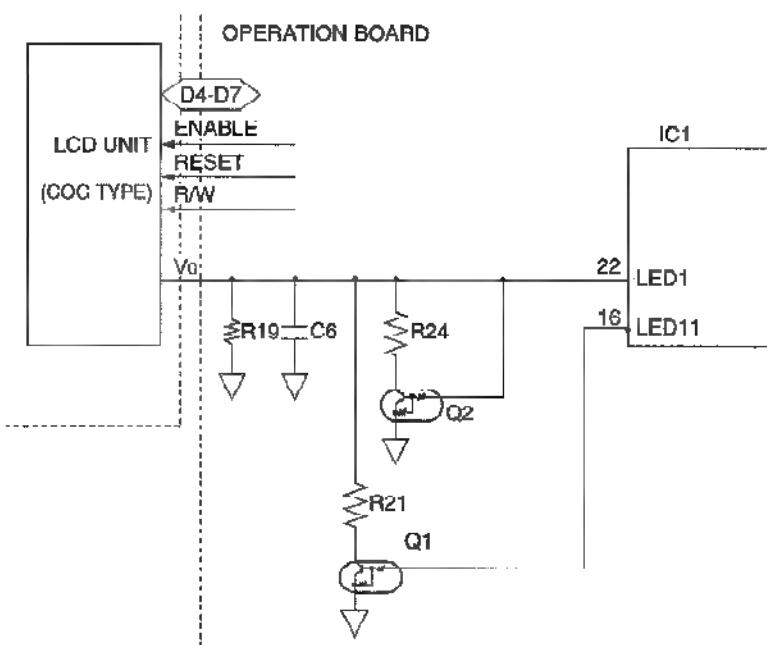
### 12. LCD COG TYPE COG: Chip On Glass

The Gate Array (IC1) only needs to write the ASCII code from the data bus (D4~D7). V<sub>0</sub> is the power supply for the crystal drive.

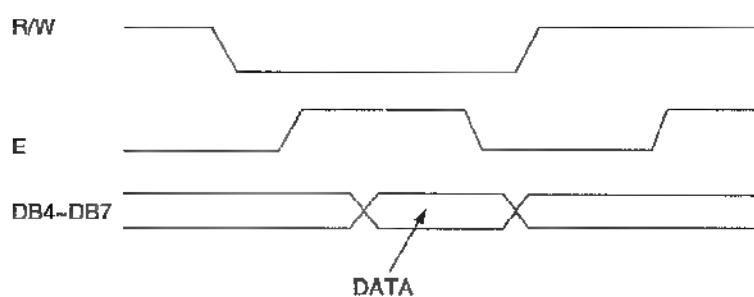
R19, R21 and R24 are the density control resistors, and Q1 and Q2 are the density control transistors.

Consequently, this time setting (positive clock) is generated by the LCD interface circuitry in the gate array (IC1).

Circuit Diagram



Timing Chart



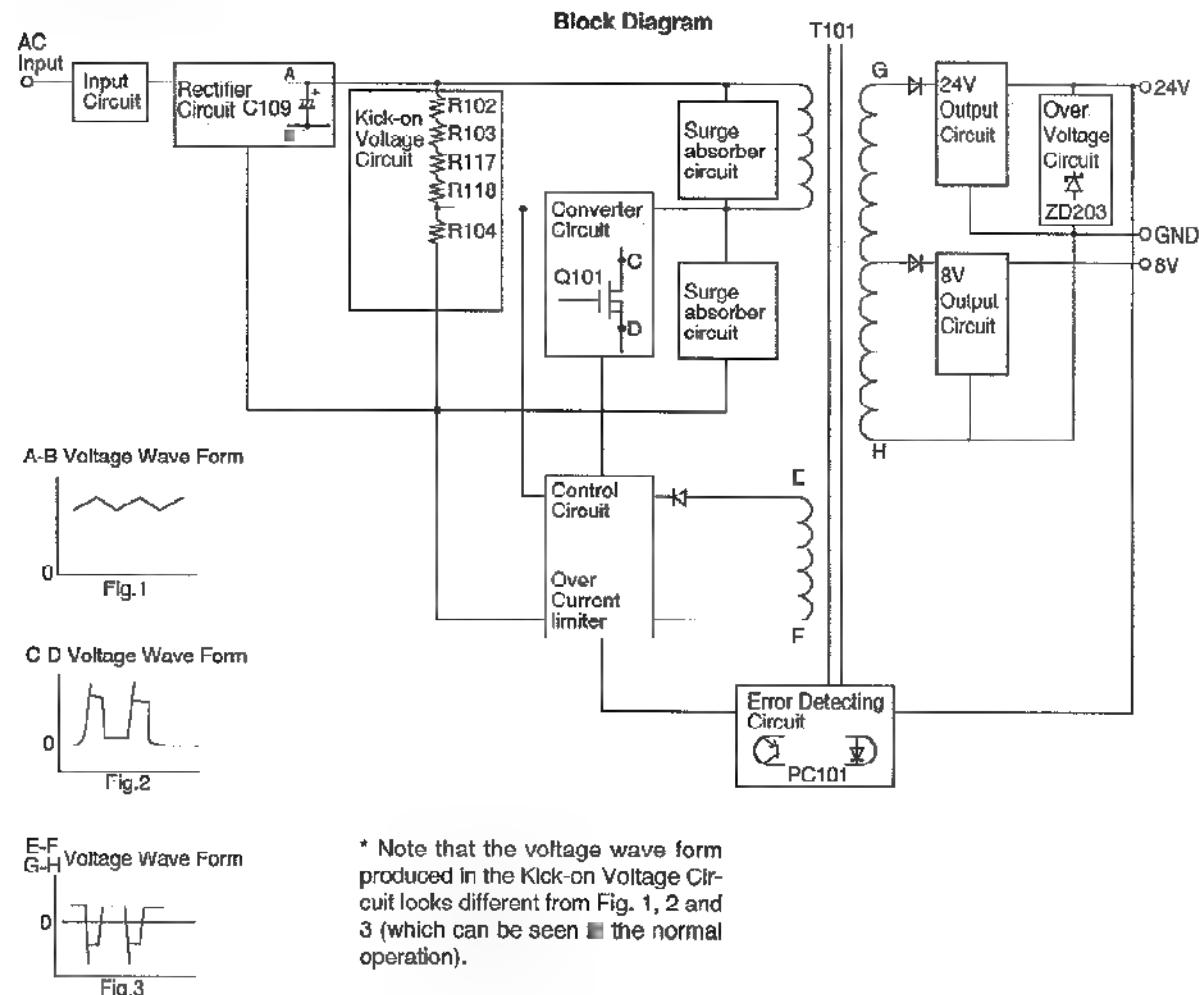
Density	Light	Normal	Dark
LED 1 (IC1-22 pin)	L	L	H
LED 11 (IC1-16 pin)	L	H	H

### 13. POWER SUPPLY BOARD SWITCHING SECTION

This power supply unit uses RCC (Ringing Choke Converter) method.

#### OPERATION:

When the power supply unit is turned on, bias is applied to Q101 via the Kick-on Voltage Circuit. Secondly, the current runs through T101 and goes into the E-F winding where voltage is generated, and then the Control Circuit is activated. Lastly, this unit starts normal operation. (See the following block diagram. Fig.1~3 show voltage wave forms seen in the positions of A-B, C-D, E-F and G-H in the block diagram.)



The following are brief explanations regarding the main circuit operations.

#### [Input Circuit]

The input current goes into the input rectifier circuit through the filter circuit. The filter circuit decreases the ripple voltage and ripple electric field strength.

#### [Rectifier Circuit]

The input current is rectified by D101, D102, D103 and D104 and charge C109 to make DC voltage (Fig.1). Then it supplies power to the converter circuit. The inrush current is limited by the thermistor TH101.

#### [Kick-on Voltage Circuit]

Bias is applied to the Q101 gate via this circuit when the AC power is turned on and Q101 begins operating.

## KX-FT37AL

### [Convertor circuit]

#### RCC (Ringing Choke Converter)

##### Method of the Constant Voltage Control Mechanism

① RCC functions to get the constant output voltage by varying the ratio of the number of transformer windings and the ratio of the time intervals of  $T_{ON}$ <sup>1</sup> and  $T_{OFF}$ <sup>2</sup>.

\*1:  $T_{ON}$  = Period of time when Q101 is ON

\*2:  $T_{OFF}$  = Period of time when Q101 is OFF

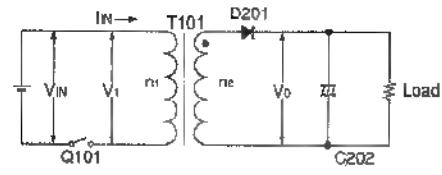
Figure A(a) illustrates the principle of RCC.

The voltage generated by the primary winding can be represented by Figures A(b) and (c).

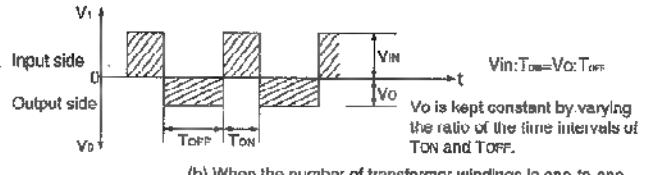
When the winding ratio is one-to-one, the circuit functions to make the product of  $T_{ON}$  and the input voltage constant with the product of  $T_{OFF}$  and the output voltage.

Using a different winding ratio results in the voltage function given by the formula in Figure A(c)

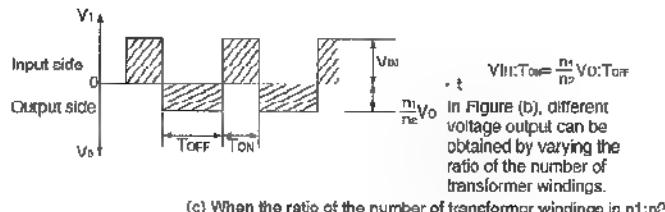
$V_o$  is kept constant by changing the ratio of  $T_{ON}$  and  $T_{OFF}$  in response to variations in input voltage.



(a) Principle of the RCC method



(b) When the number of transformer windings is one-to-one



(c) When the ratio of the number of transformer windings is  $n_1:n_2$

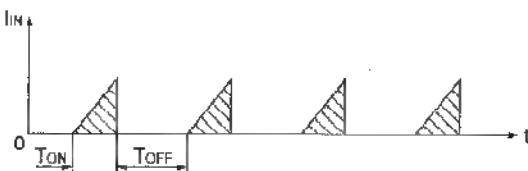
⟨Figure A⟩

② When the output voltage becomes stable, RCC goes into the idle operation. In this case,  $V_o$  is kept constant by controlling only  $T_{ON}$  without changing the ratio between  $T_{ON}$  and  $T_{OFF}$  (i.e. with the duty ratio remaining constant) in response to variations in output current. Figure B (a) and (b) shows how  $T_{ON}$  varies in response to variations in output current. The input current must be increased as output current increases, making  $T_{ON}$  longer (ex. in the copying mode).

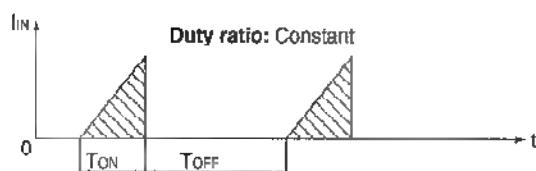
This mechanism enables RCC to operate in a stable condition when a load increases.

### Principle of Constant Voltage Operation Given Variations in the Output Current Under the RCC Method

$I_{IN}$  = Input current



(a) An input current  $I_{IN}$  waveform when output current is low  
(In the idle operation)



(b) An input current  $I_{IN}$  waveform when output current is high (i.e. when a load is high)  
(ex. In the copying mode)

**[Surge Absorber Circuit]**

This circuit is for absorbing surge voltage generated by the transformer.

**[Control Circuit and Error Detecting Circuit]**

The control circuit amplifies the output with increased voltage detected in the error detecting circuit. Then it drives the main transistor (Q101).

In this power supply, the duty ratio is defined by changing the ON period of the main transistor.

This is shown as follows.

When the output voltage of the 24V circuit increases, the current of the photo coupler PC101 Increases, the pulse width of the Control Circuit becomes narrower and the ON period of Q101 becomes shorter.

**[Over Current Limiter (O.C.L.)]**

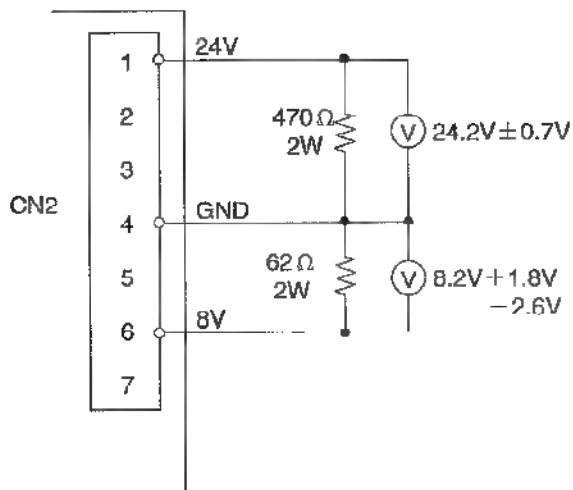
The highest  $T_{on}$  (while Q101 is ON) is limited by a limiter circuit (Control Circuit) of 24V. The 24V output is limited by this circuit.

**[Over Voltage Circuit]**

If the 24V output increases because the error detecting circuit or control circuit is broken, ZD203 will short causing the 24V output to go to 0 V.

**Dummy load method (to quickly check the power supply output)**

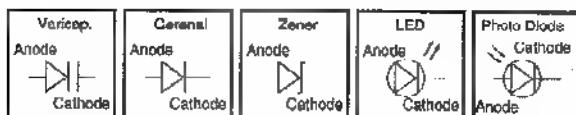
When checking the power supply output, set the following dummy load.



## KX-FT37AL

### ■ FOR THE SCHEMATIC DIAGRAM

1. DC voltage measurements are taken with an oscilloscope or a tester with a ground.
2. The schematic diagram and circuit board may be modified at any time with the development of new technology.



#### Important safety notice

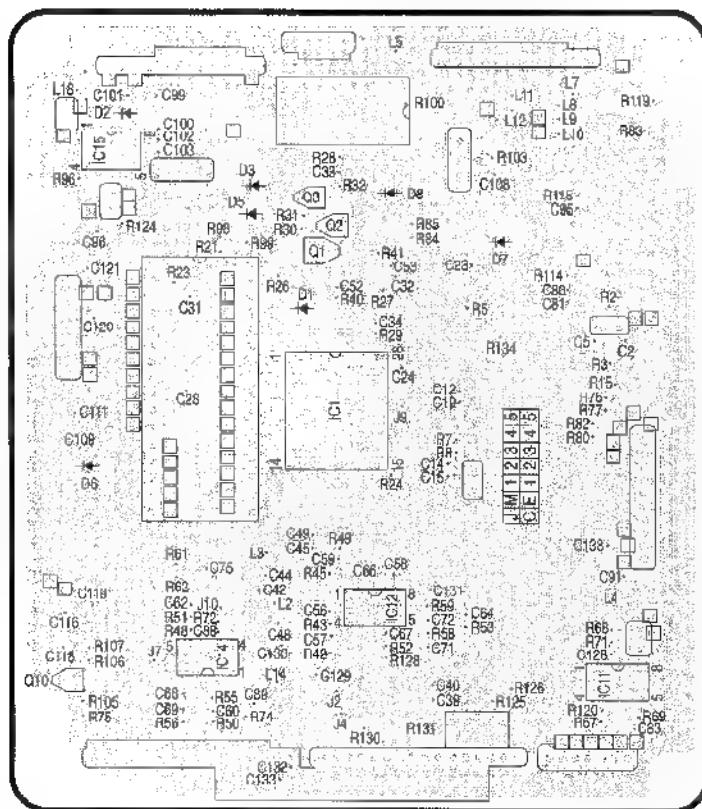
Components identified by a  $\Delta$  mark have special characteristics important for safety. When replacing any of these components, use only the manufacturer's specified parts.

KX-FT37AL

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## PRINTED CIRCUIT BOARD (DIGITAL BOARD)

(BOTTOM VIEW)



**Notes:**

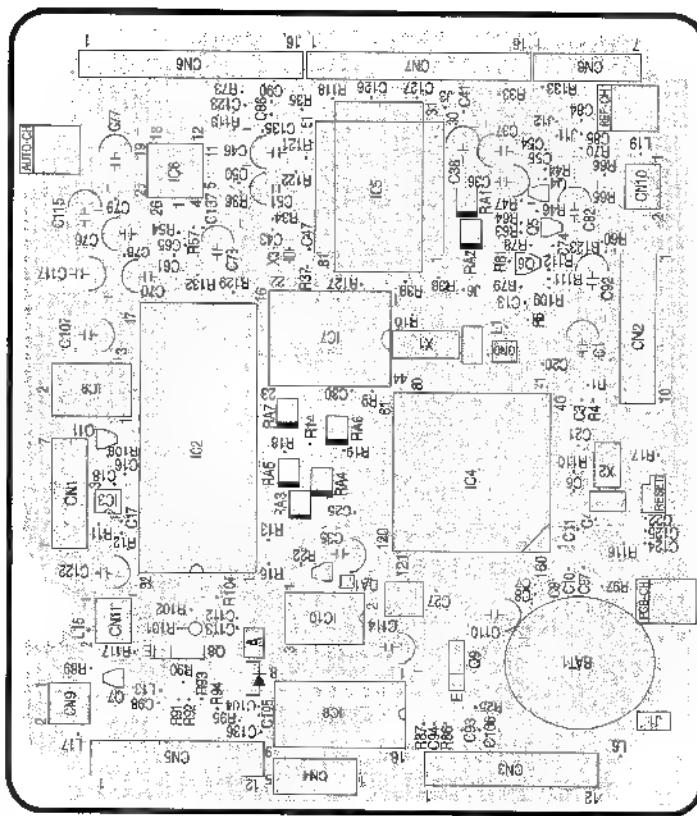
**Notes:** 1. The circuit shown in  on the conductor indicates printed circuit on the front side of the printed circuit board.

## Notes

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## PRINTED CIRCUIT DIAGRAM (DIGITAL BOARD)

## (COMPONENT VIEW)



## Notes

**Notes:**

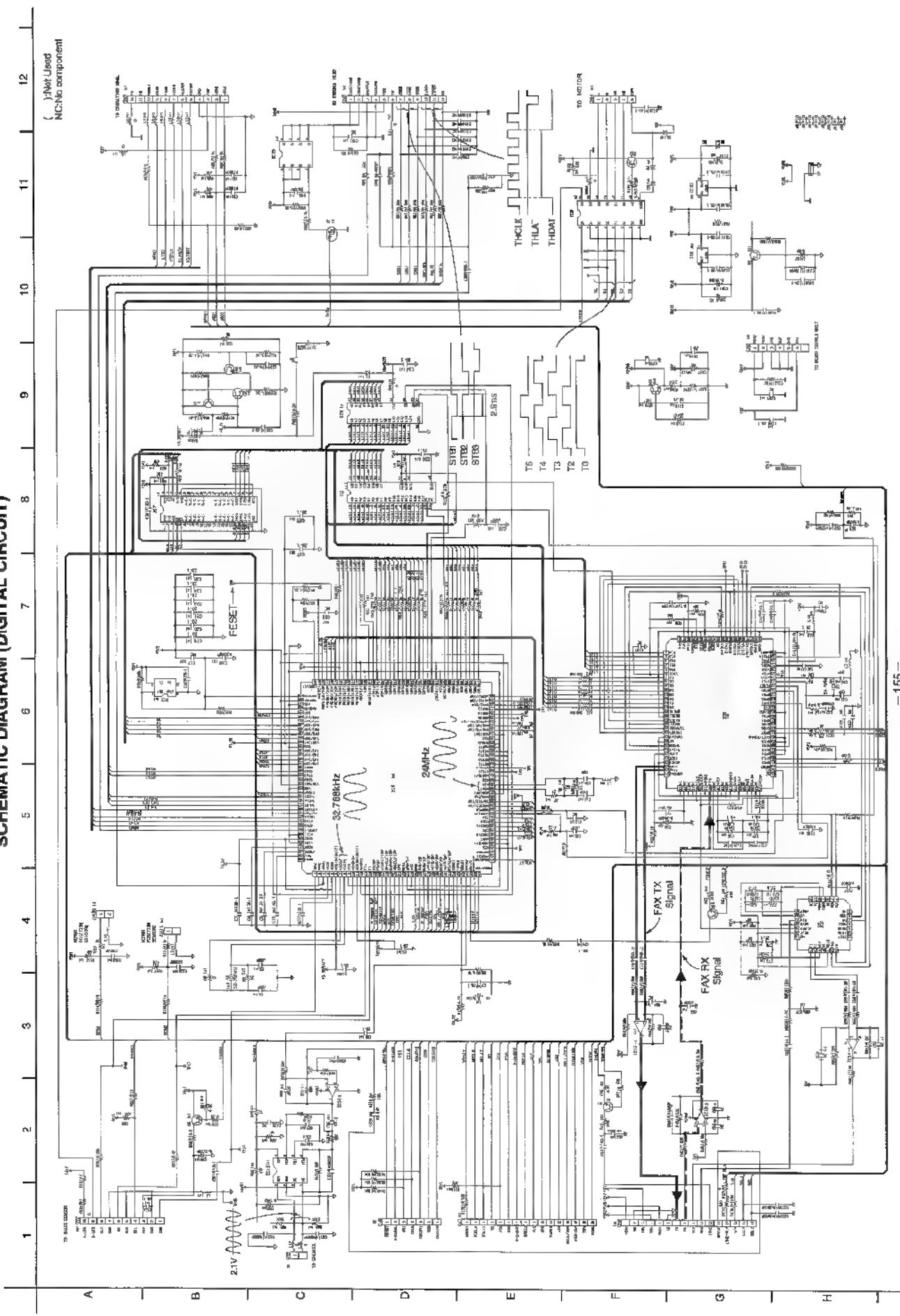
**Notes:**

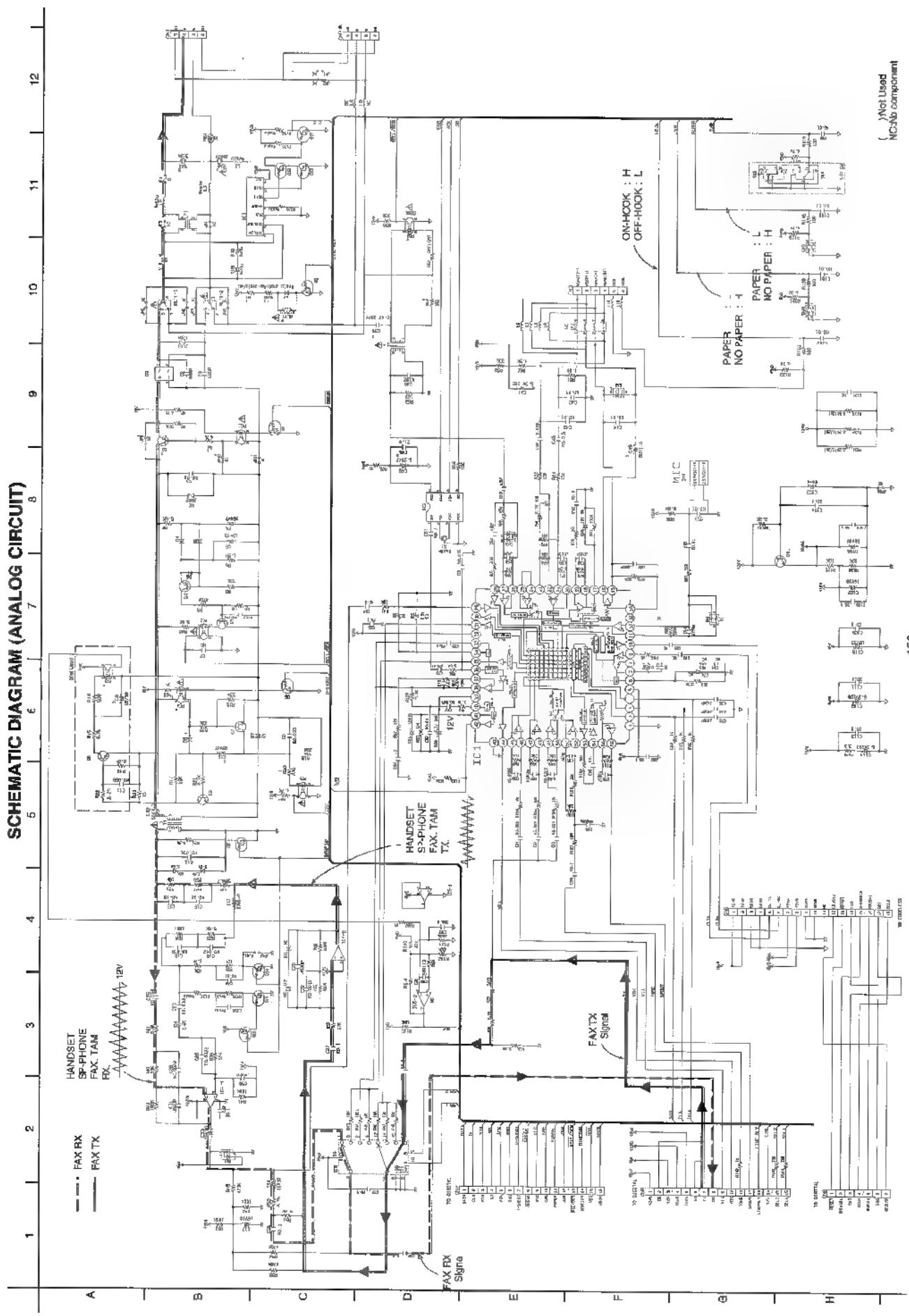
1. The circuit shown in  on the conductor indicates printed circuit on the front side of the printed circuit board.

4

SCHEMATIC DIAGRAM (DIGITAL CIRCUIT)

INCINERATION





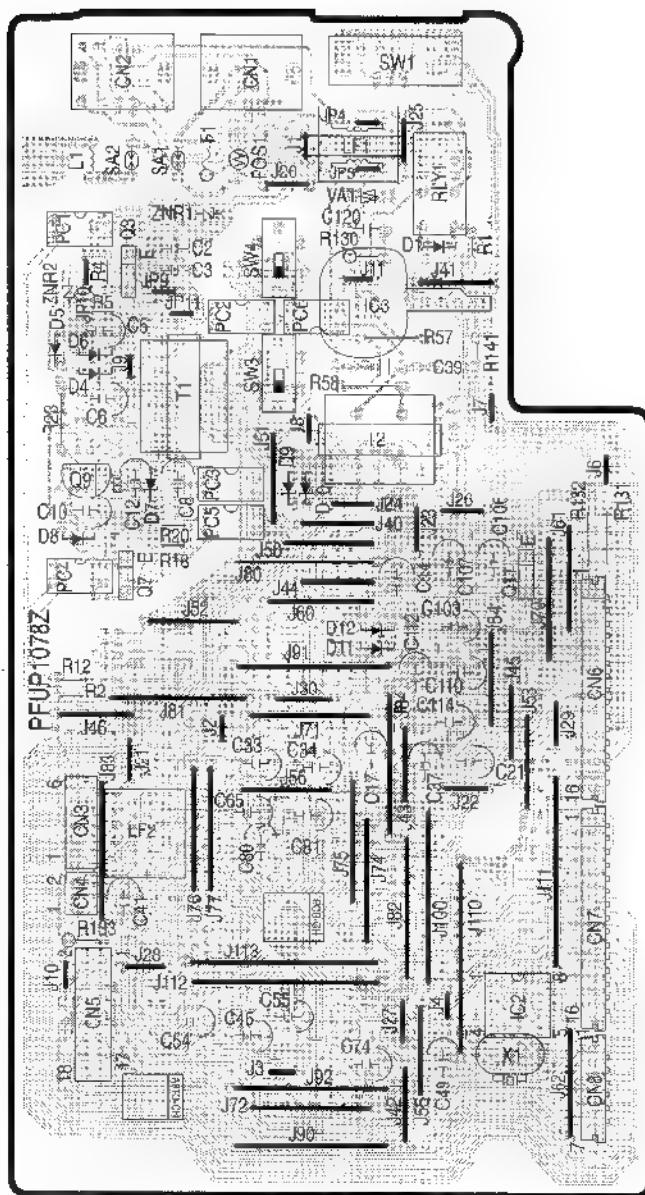
Not Used  
NCGR component

KX-FT374L

KX-FTT374L

## PRINTED CIRCUIT BOARD (ANALOG BOARD)

## (COMPONENT VIEW)



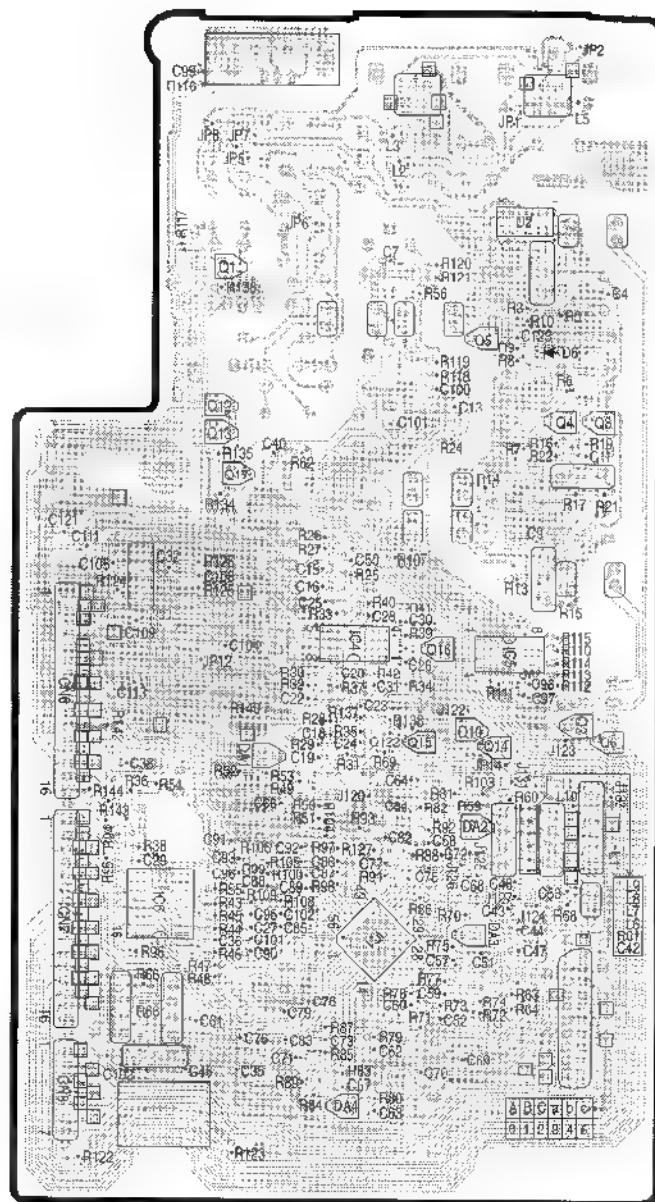
-157-

KX-FT37AL

KX-FT37AL

## PRINTED CIRCUIT BOARD (ANALOG BOARD)

(BOTTOM VIEW)

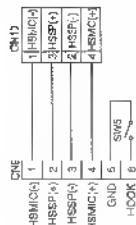


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SCHEMATIC DIAGRAM AND PRINTED CIRCUIT BOARD (HANDSET)

## HANDSET CIRCUIT



HANDSET BOARD

## (COMPONENT VIEW)



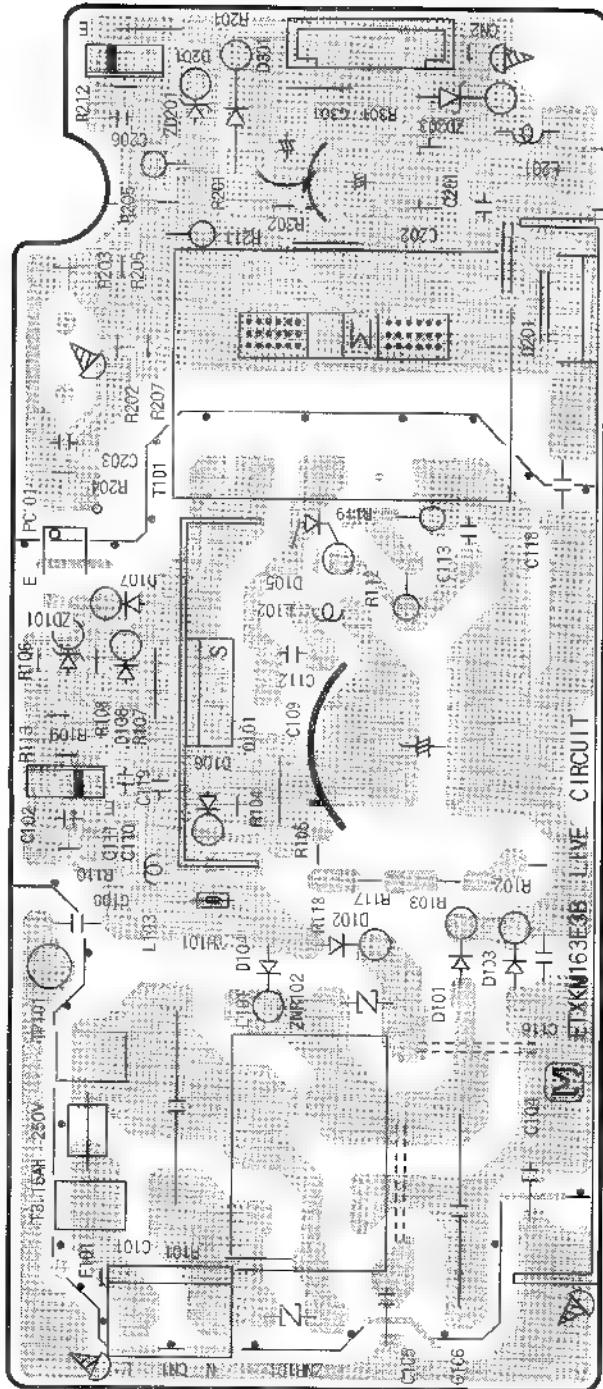
-153-

**KX-F737AL**

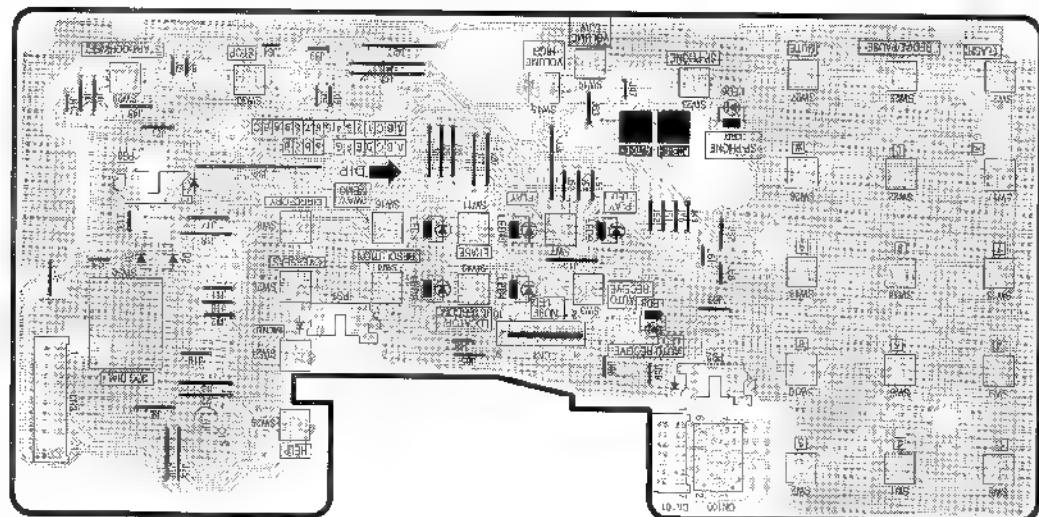
**KX-F737AL**

**PRINTED CIRCUIT BOARD (SWITCHING POWER SUPPLY)**

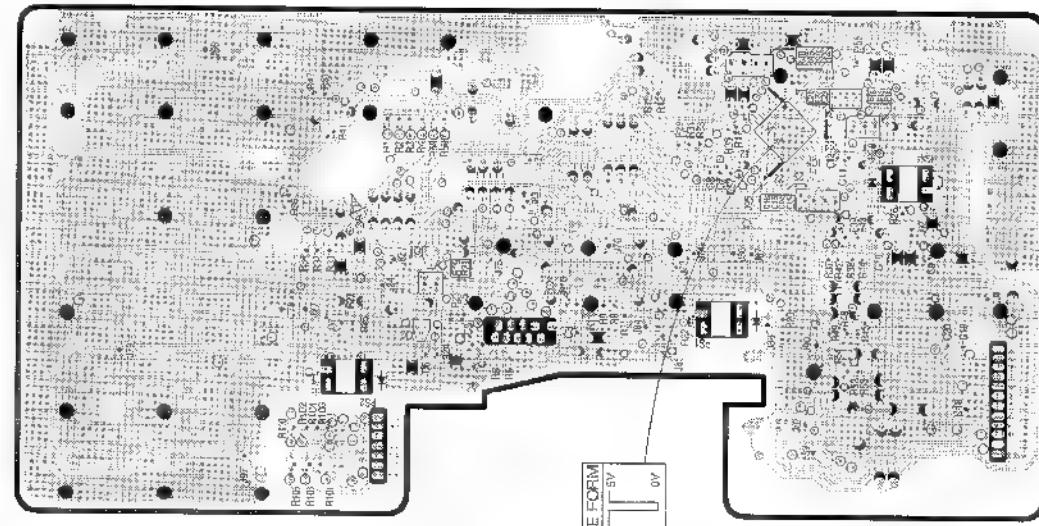
(COMPONENT VIEW)



Note: When measuring the waveform on the primary circuit of the Switch Power Supply Board, be sure to insulate the ground of the oscilloscope's probe from the ground of its power supply.



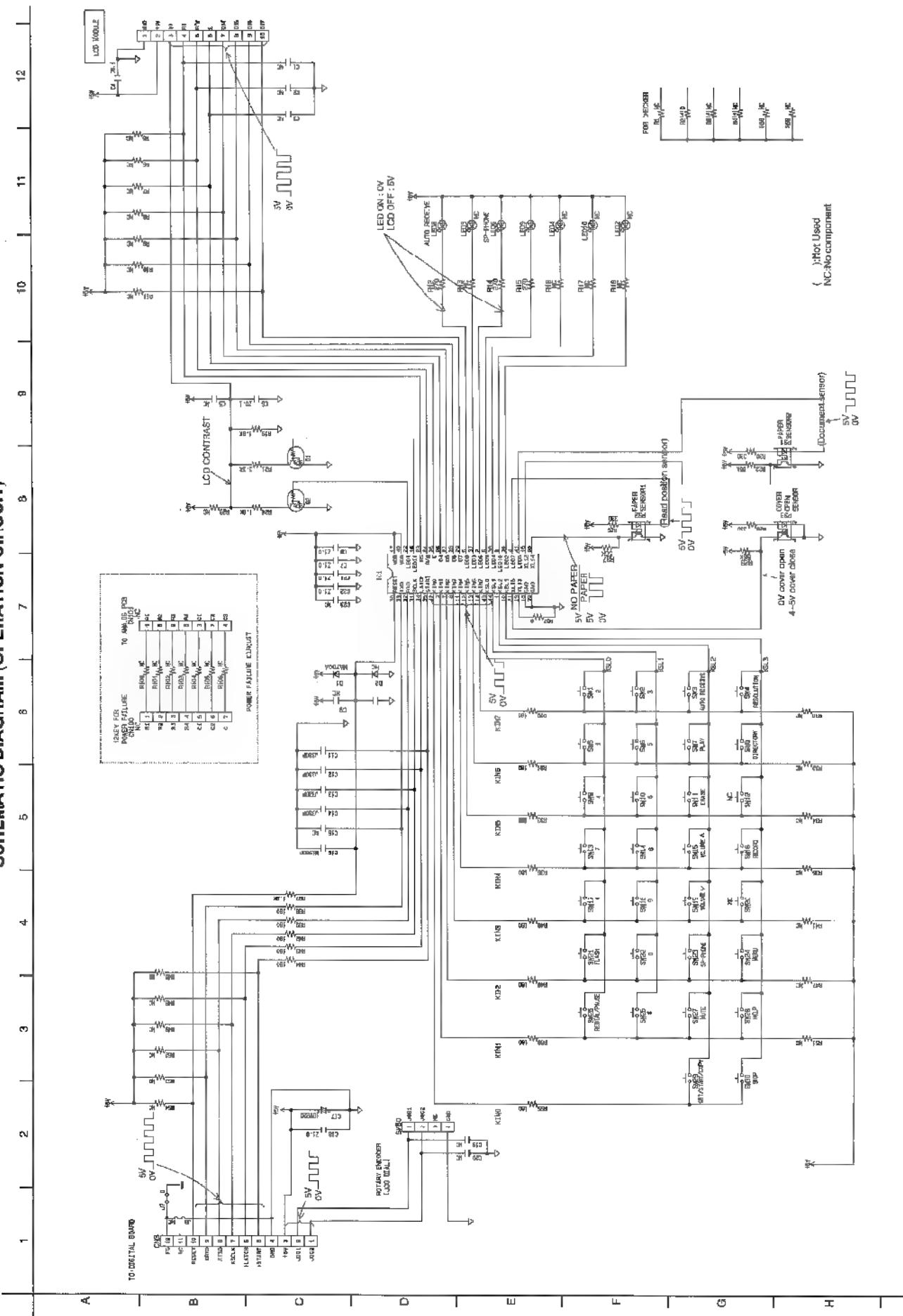
### {COMPONENT VIEW}



(BOTTOM VIEW)

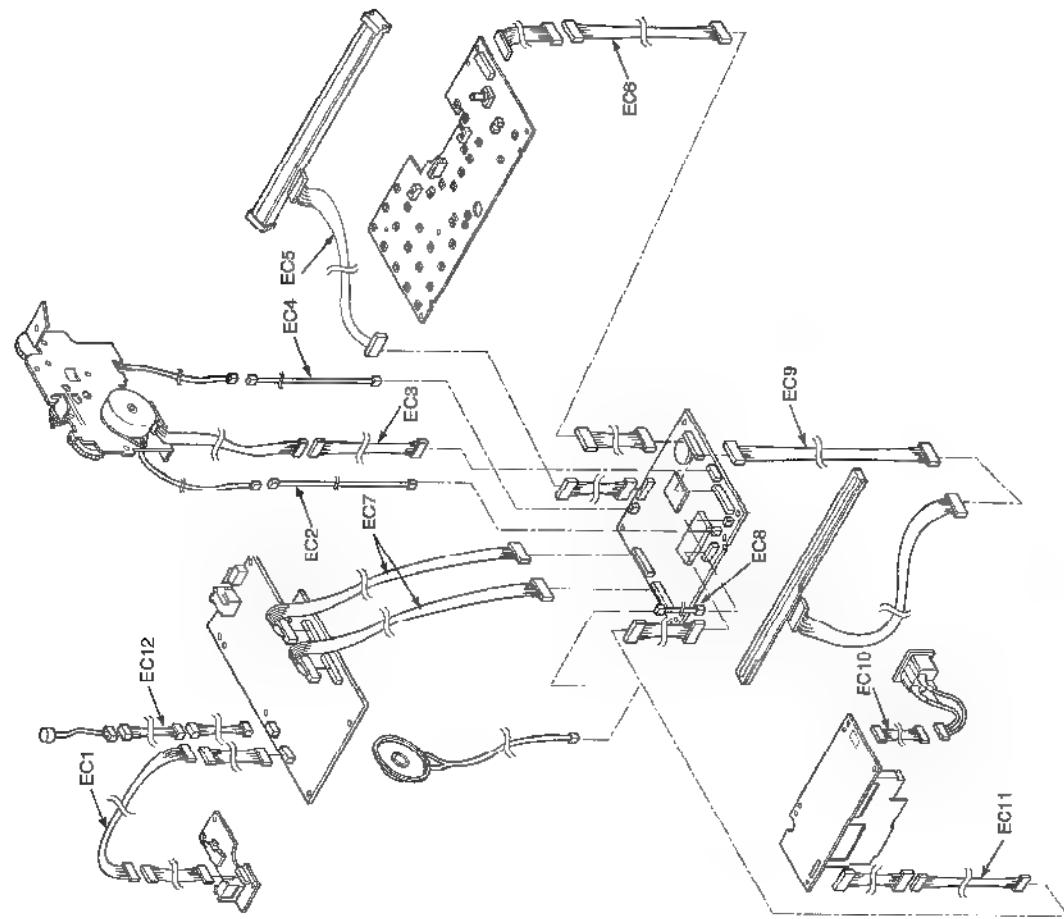
**KX-FT37AL**

**SCHEMATIC DIAGRAM (OPERATION CIRCUIT)**



## TERMINAL GUIDE OF THE ICS TRANSISTORS AND DIODES

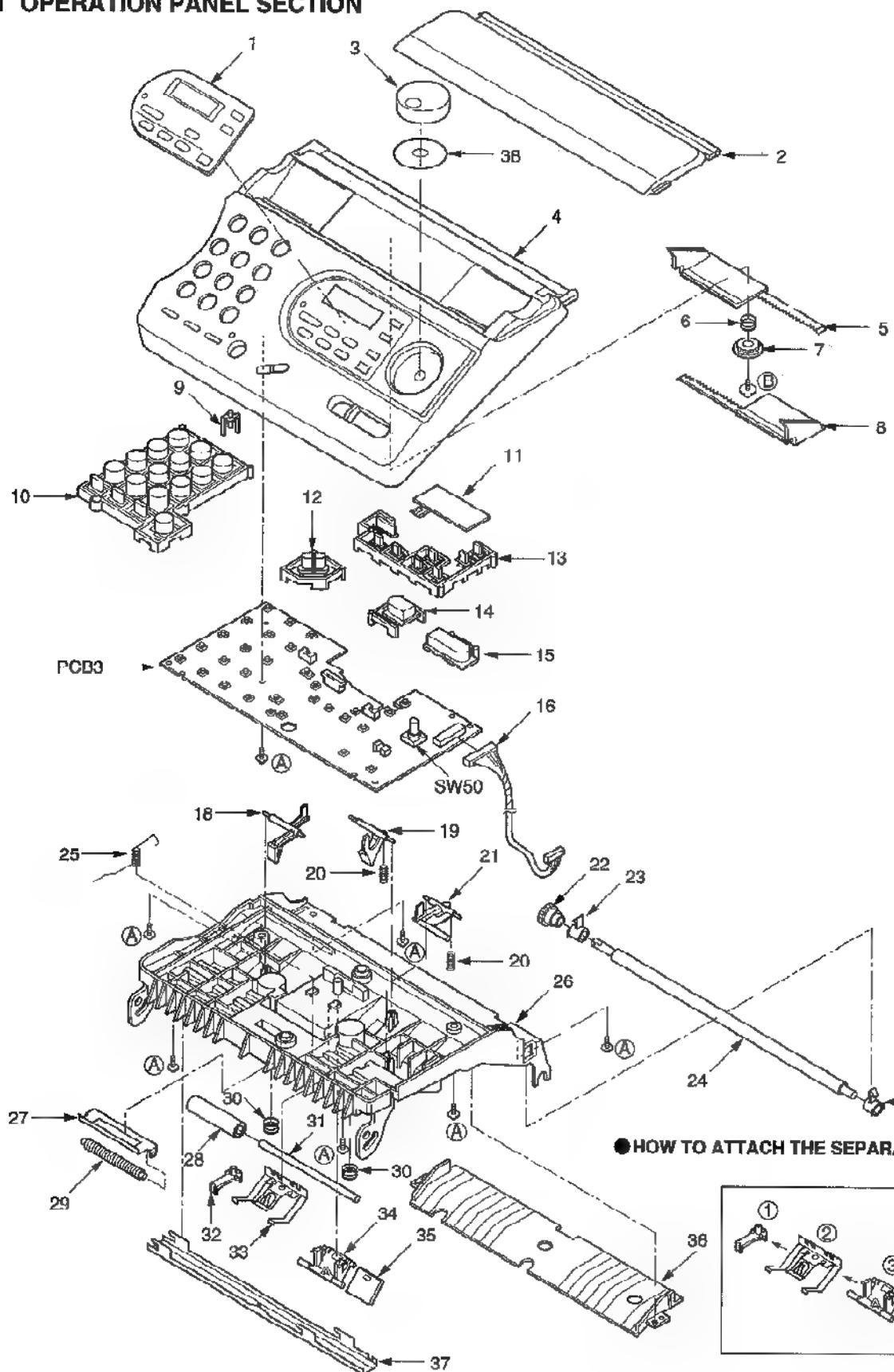
## FIXTURES AND TOOLS



 PFV13B0842AK	 PFV1TC4052BF	 PFV1R657556	 PQV1BA1203	 PFV1M6585M1
 PFV1G16256FF	 PFV1FT37AL	 PQV1M2903M	 PQV1M14558M	 PQV1M14558M
 PQV1R10485	 AN5382NFA	 PQV1S1Z40F1	 PQV1A3377P	 PQV1M1374AE
 PQV1DTC143E	 PQV1DTC14EJ	 2SB1932, 2SD1921Q	 2SA1627	 PQV1M1374
 PQV1DQ52Z5	 PQV1DQ52Z5	 2SD1423A-R	 PQV1D21DQ4	 HL571
 1SS131, PQV1DZ52F6	 PQV1DZ52F6	 PQV1DZ52F6	 MA7200	 PQV1D325CA47
 MA7270B	 PQV1DML8245	 MA1643	 PQV1S144810Y	 2SC3311
				 2SC2741S

## CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION

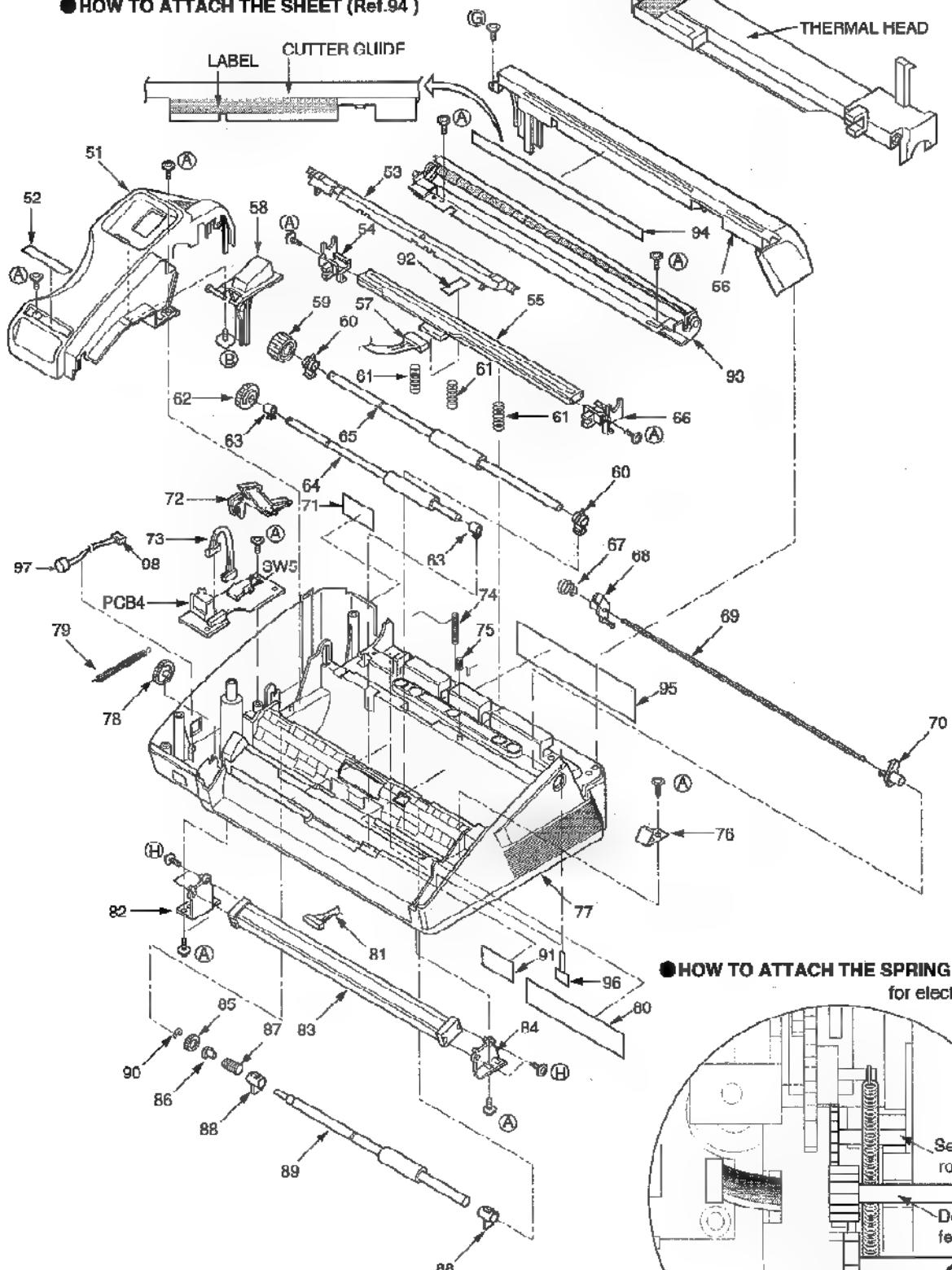
## 1 OPERATION PANEL SECTION



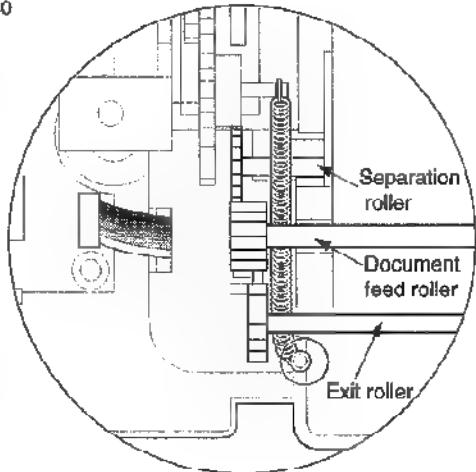
## 2. UPPER CABINET SECTION

## ● HOW TO ATTACH THE SHEET (Ref.92)

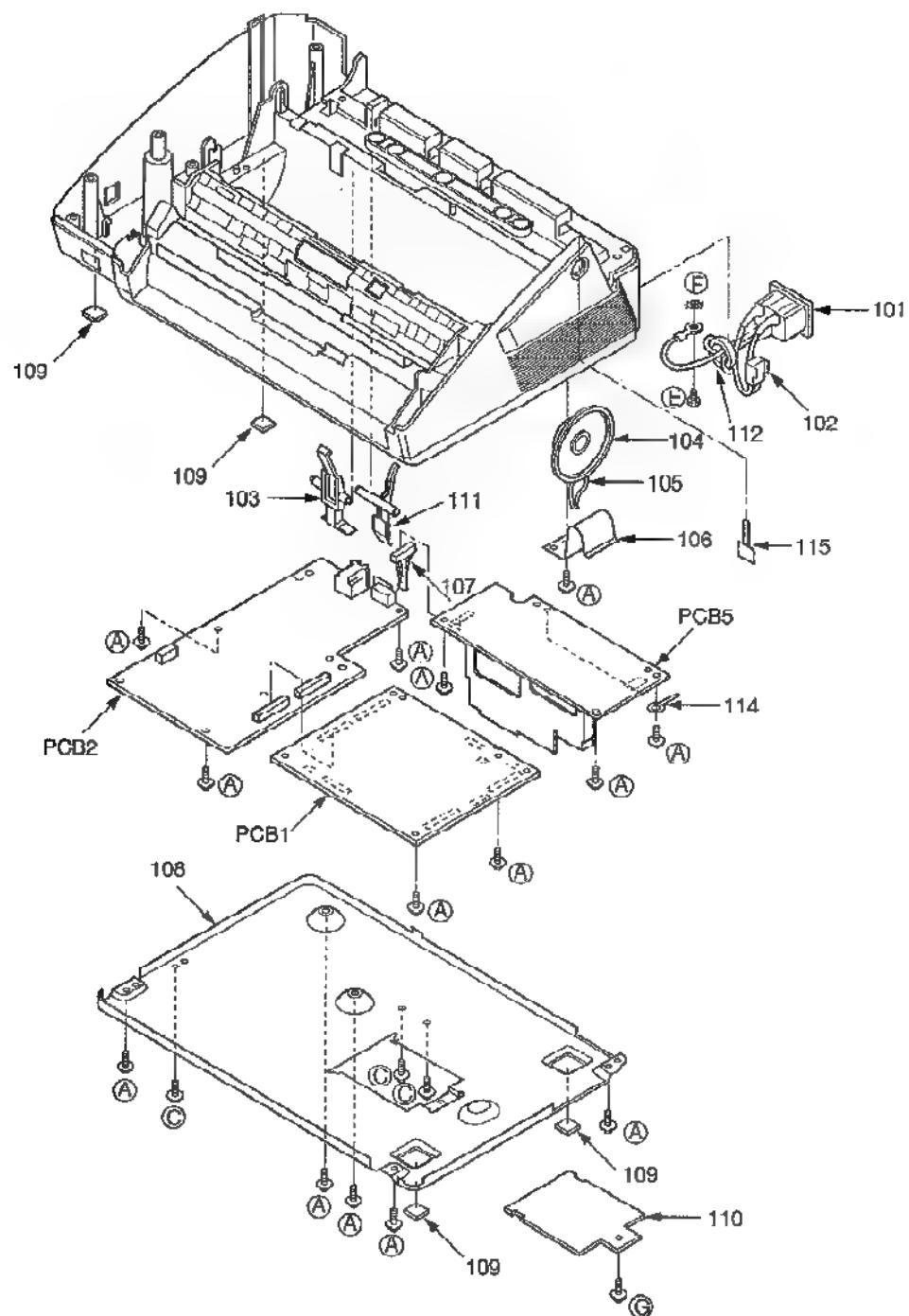
● HOW TO ATTACH THE SHEET (Ref.94 )



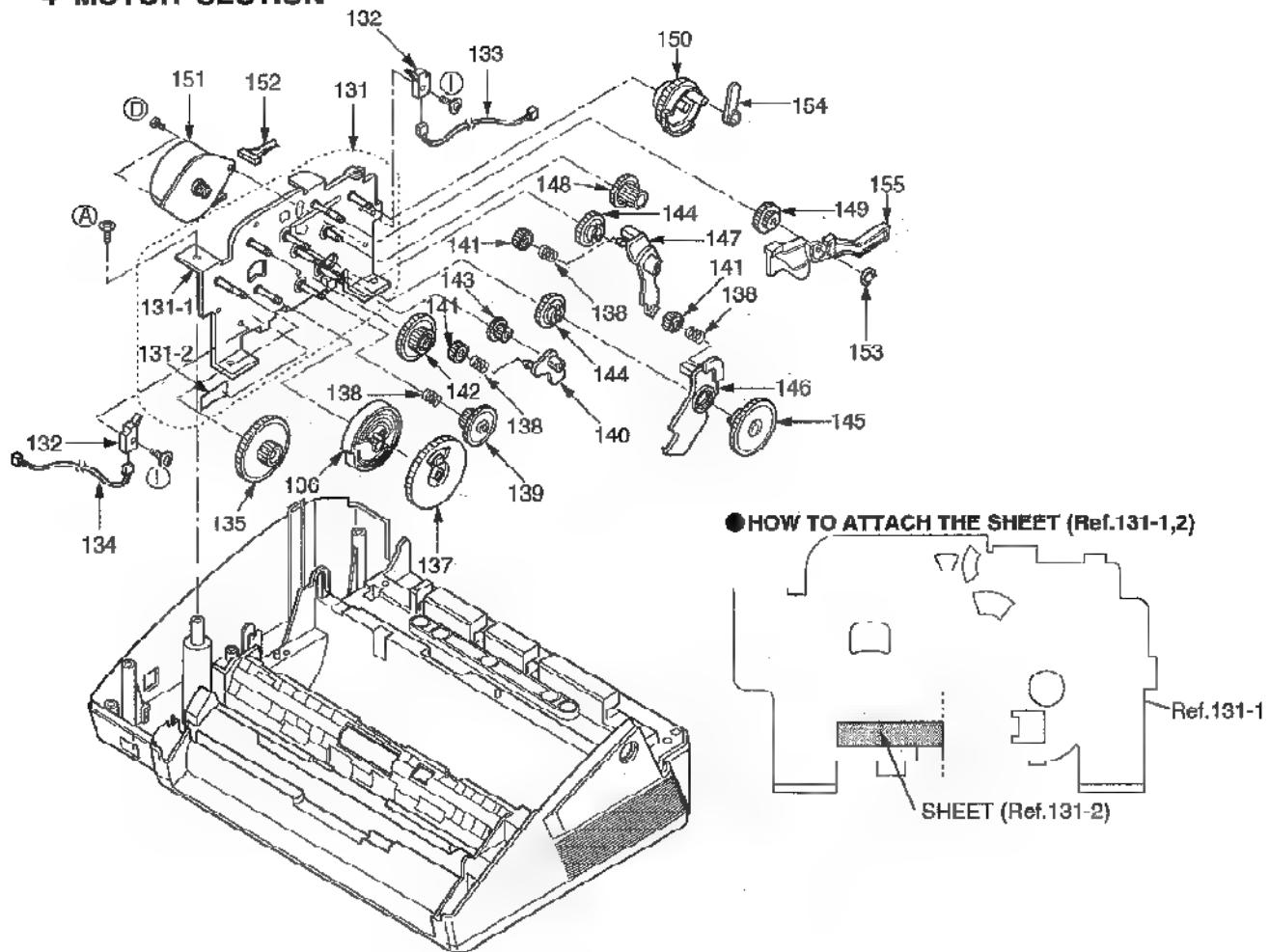
## ● HOW TO ATTACH THE SPRING (Ref.79) for electric statics.



## 3. LOWER CABINET /P.C.B. SECTION



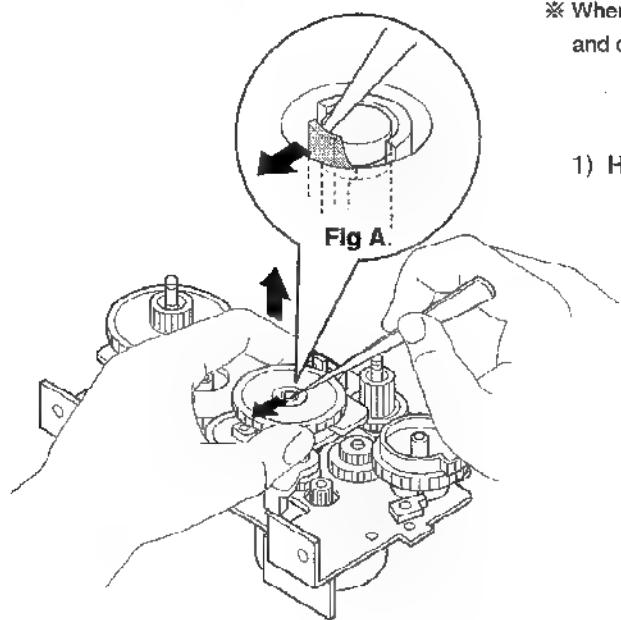
4 MOTOR SECTION

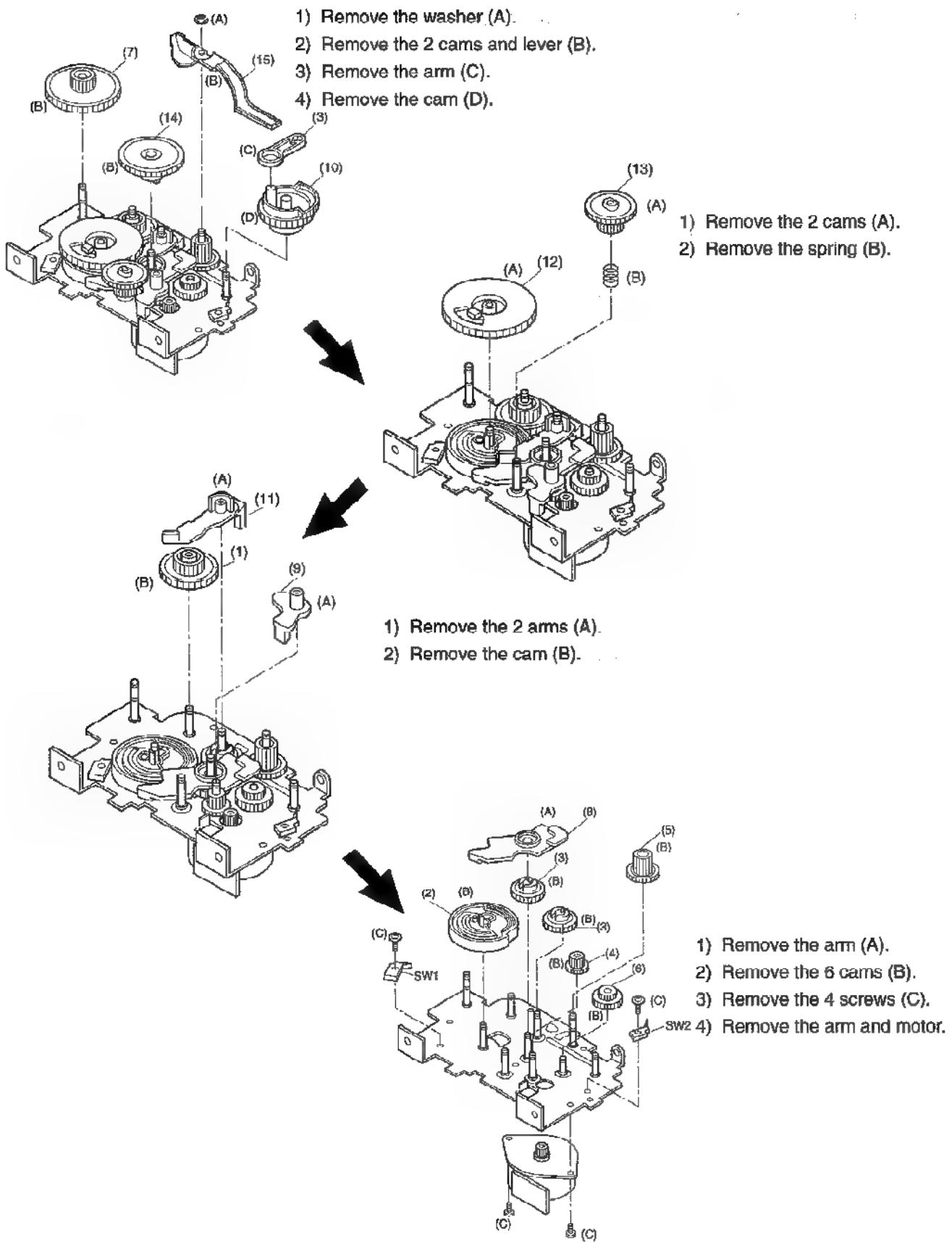


● HOW TO REMOVE THE EACH CAMS

※ When attaching, place it so that the cam number and chassis number match.

1) Remove the CAM from the gray area.(See Fig A.)





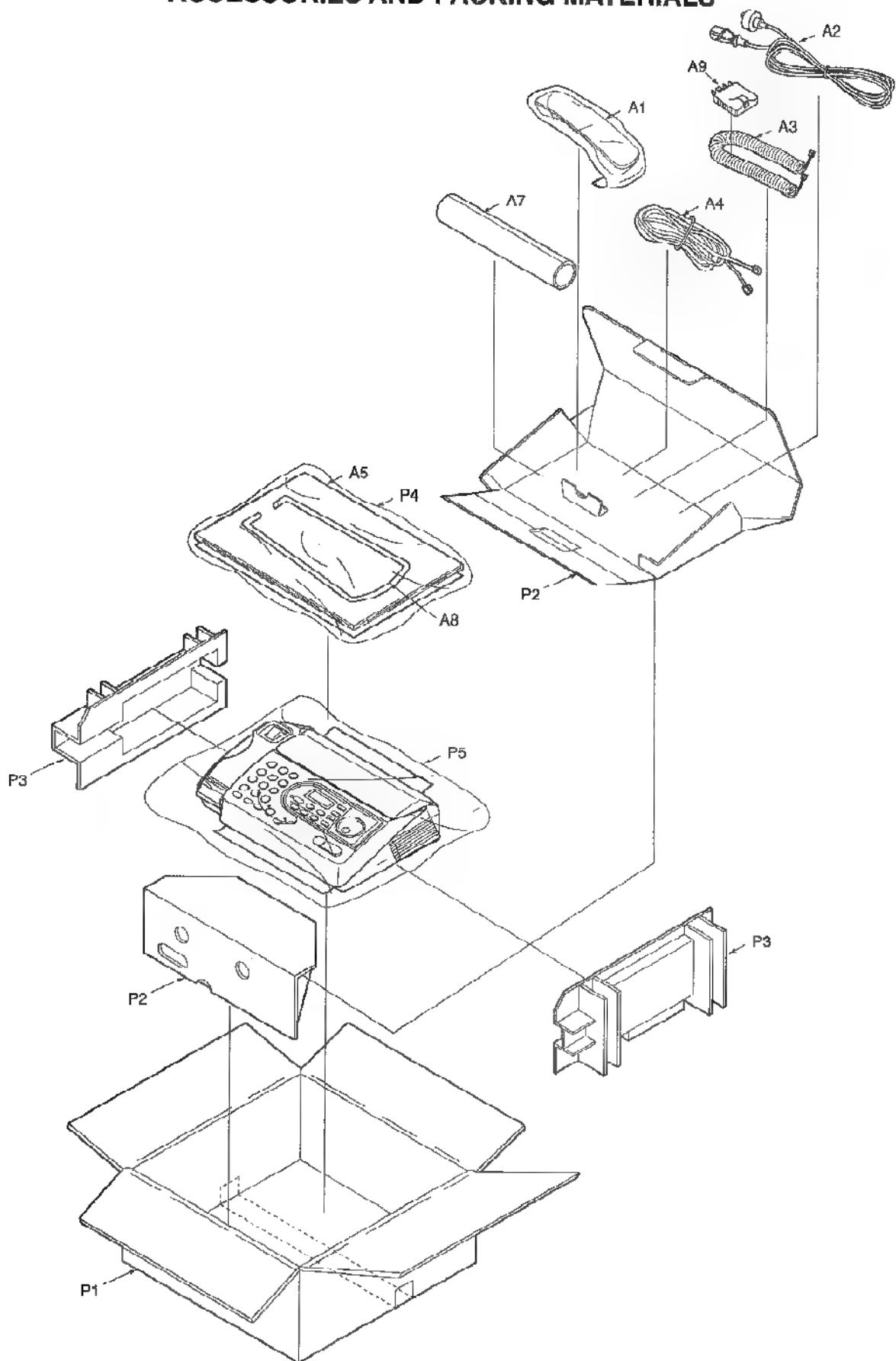
The ( ) numbers are the numbers marked on the corresponding CAM.

**5. ACTUAL SIZE OF SCREWS AND WASHER**

	Part No.	Illustration
Ⓐ	XTW3+S10P	
Ⓑ	XTW3+W6P	
Ⓒ	X3N3+W6FZ	
Ⓓ	XYC31CF6	
Ⓔ	XSB4+6	
Ⓕ	XWC4B	
Ⓖ	XTW3+U6L	
Ⓗ	XTW26+8P	
Ⓘ	XST2+8	

## ACCESSORIES AND PACKING MATERIALS

KX-FT37AL



## KX-FT37AL

### REPLACEMENT PARTS LIST

This replacement parts list is for the KX-FT37AL only.

Model KX-FT37AL				Ref. No.	Part No.	Part Name & Description	Pcs			
<b>Notes:</b>										
1. The marking (NTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing part and product retention. After the end of this period, the assembly will no longer be available.										
2. Important safety notice. Components identified by the <b>A</b> mark special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.										
3. The <b>S</b> mark indicates service standard parts and may differ from production parts.										
4. <b>RESISTORS &amp; CAPACITORS</b> Unless otherwise specified. All resistors are in ohms ( ) k=1000, M=1000k All capacitors are in MICRO FARADS( $\mu$ ) P= $\mu$ F										
*Type & Wattage of Resistor Type										
ERC:Solid	ERX:Metal Film	PQRD:Carbon								
ERD:Carbon	ERG:Metal Oxide	PQRQ:Fuse								
PQ4R:Chip	ERO:Metal Film	ERF:Wire Wound								
Wattage										
10,16,18:1/8W	14,26,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	5:5W					
ECFD:Semiconductor										
ECQS:Styrol	ECCD,ECKD,PQCBG,PQVP : Ceramic									
PQCBX,ECUV:Chip	ECQM,ECQV,ECQE,ECQU,ECUB : Polyester									
ECMS:Mica	ECEA,ECSZ,ECOS : Electrolytic									
ECQ : Polypropylene										
Voltage										
ECQ Type	ECQG	ECSZ Type	Others							
1H: 50V	05: 50V	0F:3.15V	OJ: 6.3V	1V: 35V						
2A:100V	1:100V	1A:10V	1A: 10V	50,14:50V						
2C:250V	2:200V	1V:35V	1C: 16V	1J: 83V						
2H:500V		OJ:6.3V	1E:25:25V	2A: 100V						
Ref. No.										
Part No.										
Part Name & Description										
Pcs										
CABINET AND ELECTRICAL PARTS										
<b>(1.OPERATION PANEL SECTION)</b>										
1	PFGP1060L	LCD PANEL		1	70	PFDE1047Y2	LEVER, LOOK (RIGHT)			
2	PFKS1016Z2	DOCUMENT TRAY		1	71	PFGT1385Z	NAME PLATE			
3	PFBE1002Z3	JOG DIAL		1	72	PFBZ1001Z	ARM, HOOK SWITCH			
4	PFGG1010R2	GRILLE		1	73	PFJS06R89Z	CONNECTOR, 6 PIN			
5	PFKR1009Z2	GUIDE, DOCUMENT GUIDE (RIGHT)		1	74	PFUS1092Z	SPRING, STATIC ELECTRIC (B)			
6	PFUG1034Z	SPRING, DOCUMENT GUIDE		1	75	PFUS1091Z	SPRING, STATIC ELECTRIC (A)			
7	PFDG1002Z	GEAR, DOCUMENT GUIDE		1	76	PFUS1045Y	SPRING, OPERATE OPEN			
8	PFKR1008Z2	GUIDE, DOCUMENT GUIDE (LEFT)		1	77	PFKM1026Y2	UPPER CABINET			
9	PFGE1001Z	LED COVER		1	78	PFDG1042Z	GEAR			
10	PFBX1030Z2	BUTTON, DIAL		1	79	PFUS1090Z	SPRING, EARTH			
11	PFAVJS10101	LIQUID CRYSTAL DISPLAY		1	80	PFQT1406Y	CAUTION LABEL, PAPER			
12	PFBC1012Z2	BUTTON, VOLUME		1	81	PFJS10R83Z	CONNECTOR, 10 PIN			
13	PFRX1031Y2	BUTTON, FUNCTION		1	82	PFMH1042Z	FRAME, CIS (LEFT)			
14	PFBC1011Z2	BUTTON, STOP		1	83	PFUO1010Z	IMAGE SENSOR			
15	PFBC1010Z1	BUTTON, START		1	84	PFMH1043Z	FRAME, CIS (RIGHT)			
16	PFJS12H85Z	CONNECTOR, 12 PIN		1	85	PFDG1038Z	GEAR, SEPARATION ROLLER			
17	Not Used			1	86	PFDE1059Z	DELAY			
18	PFDE1054Z	LEVER, READ DIRECTION		1	87	PQUS100387	SPRING, ONE WAY			
19	PFDE1055Z	LEVER, DOCUMENT DETECTION		1	88	PFDJ1019Z	SPACER, ROLLER			
20	PFUS1027Z	SPRING, DOCUMENT LEVER		2	89	PFDN1013Z	ROLLER, SEPARATION			
21	PFDE1060Z	LEVER, OPEN SENSOR		1	90	XUC2FY	RETAINING RING			
					91	PFHS1010Z	TAPE, SPEAKER			
					92	PFIX1X120Z	SHCET, THERMAL HEAD			

This replacement parts list is for the KX-FT37AL only.

Ref. No.	Part No.	Part Name & Description	Pos	Ref. No.	Part No.	Part Name & Description & Value	Pcs
ACCESSORIES AND PACKING MATERIALS							
93	PFDX1010Z	CUTTER	1	A1	PFJXE0505Z	HANDSET	1
94	PFQ1T1429X	CAUTION LABEL, JAM	1	A2	PQJA224Y	POWER CORD	▲ 1
95	PQQT118AY	CAUTION I ARFI	1	A3	PQJA212M	HANDSET CORD	1
96	PQHR136Z	CLAMPER	1	A4	PQJA10035Z	TELEPHONE CORD	▲ S 1
97	PQJM128Z	MICROPHONE	1	A5	PFOX1225Z	INSTRUCTION BOOK	1
98	PFJS02Q82Z	CONNECTOR, 2 PIN	1	A6	Not Used		
(3. LOWER SECTION)				A7	PQHP10023Z	RECORDING PAPER	1
101	PQJP03S07Z	AC INLET	▲ 1	A8	PQUS10136Z	STICKER	1
102	PQJS02Q59Y	CONNECTOR, 2 PIN	1	A9	PQJP6E30V	TEL PLUG	1
103	PF0E1045Z	LEVER, PAPER SENSOR	1	P1	PPPK1399Z	GIFT BOX	1
104	PFA350PTC01Y	SPEAKER	1	P2	PPPN1106Z	ACCESSORY BOX	1
105	PFJS02P60Z	CONNECTOR, 2 PIN	1	P3	PPPN1100Z	CUSHION	1
106	PFUS1089Z	SPRING, SPEAKER	1	P4	POPP100057	RAG, POLYETHYLENE	1
107	PFJS07R81Z	CONNECTOR, 7 PIN	1	P5	PQPH79Z	PACKING SHEET	1
108	PFMD1024Z	FRAME, BOTTOM	1				
109	PTIA1001Z	RUBBER, LEGS	4				
110	PQMH10186Z	LID, ROM CHANGE	1				
111	PFDE1061Z	LFVFR, JAM SFNSOR	1				
112	PQLB1E1	FERRITE CORE	1				
113	Not Used						
114	PQHM112Z	CLAMPER	1				
115	PQHR136Z	CLAMPER	1				
(4. GEAR CHASSIS SECTION)				DIGITAL BOARD PARTS			
131	PFZMFT31BX	GEAR CHASSIS ASSY	1	PCB1	PFWP1FT37AL	DIGITAL BOARD ASS'Y (RTL)	1
131-1	PFUA1011Z	GEAR CHASSIS	1			(ICs)	
131-2	PHHS1U18Z	SHEET 1, BRAKE	1	IC1	PFVIGM6256FF	IC	1
132	PQST2A04Z	SEESAW SWITCH	2	IC2	PFWIFT37AL	IC (ROM)	1
133	PFIS02P88Z	CONNECTOR, 2 PIN	1	IC3	PFVIS80842AN	IC	1
134	PFJS02P67Z	CONNECTOR, 2 PIN	1	IC4	PFVIM66395M1	IC	1
135	PFDG1043Z	GEAR	1	IC5	PFVIR867556	IC	1
136	PFDG1054Z	CAM	1	IC6	PFVIR10485	IC	1
137	PFDG1053Z	CAM	1	IC7	PFVIMK29N04T	IC	1
138	PFU1S1111Z	SPRING	4	IC8	POVIBA12003	IC	S 1
139	PFDG1049Z	GEAR, CAM	1	IC9	POVIPQ055Z5	IC	1
140	PFDE1060Z	ARM, CHANGEOVER	1	IC10	PQVIPQ055Z5	IC	1
141	PFDG1047Z	GEAR, CHANGEOVER	3	IC11	PQVIMC34119M	IC	S 1
142	PFDG1044Z	GEAR	1	IC12	PQVINJM4558M	IC	S 1
143	PFDG1055Z	GEAR, CENTER	1	IC13	PQVINJM4559M	IC	■ 1
144	PFDG1048Z	GEAR, SUN	2				
145	PFDG1050Z	GEAR, INTERVAL	1				
146	PFDE1049Y	ARM, RX	1				
147	PFDE1048Z	ARM, TX	1				
148	PFDG1046Z	GEAR	1				
149	PFDG1077Z	GEAR	1				
150	PFDG1051Z	GEAR, CUTTER	1	Q1	2SB1197K	TRANSISTOR(SI) [or 2SB1051]	1
151	PFJQ1008Z	MOTOR	1	Q2	2SD1819A	TRANSISTOR(SI)	S 1
152	PFJS05R82Z	CONNECTOR, 3 PIN	1	Q3	2SD1819A	[2SC4155 or 2SC4081]	■ 1
153	PQFN51Z	WASHER	1	Q4	2SD1819A	TRANSISTOR(SI)	1
154	PFDE1051Z	ARM, CUTTER	1	Q5	2SD1819A	[2SC4155 or 2SC4081]	1
155	PFDE1058Z	LEVER, JAM RELEASE	1	Q6	2SB1197K	TRANSISTOR(SI) [or 2SB1051]	1
				Q7	POVTD1C114EU	TRANSISTOR(SI) [or UN52111]	1
				Q8	2SB1322	TRANSISTOR(SI)	S 1
				Q9	2SD1994A	TRANSISTOR(SI)	1
				Q10	2SD1819A	TRANSISTOR(SI)	S 1
				IC15	PFVTSI4431DY	TRANSISTOR(SI)	1

**KX-FT37AL**

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Ref. No.	Part No.	Part Name & Description	Value	Pcs	Ref. No.	Part No.	Value	Pcs
		(DIODES)			R18	ERJ3GEYJ271	270	1
D1	RLS71	DIODE(SI)		1	R19	ERJ3GEYJ271	270	1
D3	PFVDRMRLS245	DIODE(SI)		1	R21	ERJ3GEYJ473	47K	1
D4	MA7200	DIODE(SI)		S 1	R22	ERJ3GEYJ102	1K	1
D5	PFVDRMRLS245	DIODE(SI)		1	R24	ERJ3GEYJ473	47K	1
D7	PQVDRLZ6R6	DIODE(SI)		1	R25	ERJ3GEYJ222	2.2K	1
DA1	MA141WK	DIODE(SI)		1	R26	ERJ3GEYJ122	1.2K	1
					R27	ERJ3GEYJ391	390	1
					R28	PQ4R10X.J122	1.2K	S 1
					R29	ERJ3GEYOR00	0	1
		(BATTERY)			H30	PQ4H10XJ821	820	S 1
BAT1	PQPCT2032H00	LITHIUM BATTERY		S 1	R31	ERJ3GEYJ472	4.7K	1
					R32	FR.13GFY.J012	9.1K	1
		(CONNECTORS)			R33	PQ4R10XJ150	15	1
CN1	PQJP7G30Y	CONNECTOR, 7P		1	R34	ERJ3GEYOR00	0	1
CN2	PQJP10G30Y	CONNECTOR, 10P		1	H35	PQ4R10XJ101	100	1
CN3	PQJP12G30Y	CONNECTOR, 12P		S 1	R36	ERJ3GEYJ473	47K	1
CN4	PQJP5G30Y	CONNECTOR, 5P		1	R37	FR.13GFY.J101	100	1
CN5	PJFJP12A12Z	JACK		1	R38	ERJ3GEYJ103	10K	1
CN6	PQJP16A19Z	CONNECTOR, 13P		1	R39	ERJ3GEYJ103	10K	1
CN7	PQJP16A19Z	CONNECTOR, 13P		1				
CN8	PQJP2G10M7	CONNECTOR, 2P		1				
CN10	PQJP2G30Y	CONNECTOR, 2P		1				
CN11	HJJP02A08Z	CONNECTOR, 2P		1				
		(RESISTORS)						
J2	PQ4R10XJ000	0		1	R50	ERJ3GEYJ393	39K	1
J3	PQ4R10X.J000	0		1	R51	ERJ3GEYJ303	39K	1
J4	PQ4R10XJ000	0		1	R52	ERJ3GEYJ393	39K	1
J6	PQ4R10XJ000	0		1	R53	ERJ3GEYJ393	39K	1
J7	PQ4H10XJ000	0		1	R54	ERJ3GEYJ472	4.7K	1
J9	PQ4R10XJ000	0		1	R55	ERJ3GEYJ103	10K	1
J10	PQ4R10XJ000	0		1	R56	ERJ3GEYJ103	10K	1
L13	PQ4H10XJ000	0		1	R57	ERJ3GEYJ184	180K	1
L17	PQ4R10XJ000	0		1	R58	ERJ3GEYJ103	10K	1
L18	PQ4R10X.J000	0		1	R59	ERJ3GEYJ103	10K	1
L5	ERJ3GEYOR00	0		1	R60	ERJ3GEYJ102	1K	1
L6	EHJ3GEY0H00	0		1	R62	ERJ3GEYJ150	15	1
R1	ERJ3GEYJ472	4.7K		1	R63	ERJ3GEYJ222	2.2K	1
R2	ERJ3GEYOR00	0		1	R64	ERJ3GEYJ473	47K	1
R4	ERJ3GEYJ472	4.7K		1	R65	PQ4R10XJ154	150K	S 1
R5	ERJ3GEYJ472	4.7K		1	R66	PQ4R10XJ114	110K	S 1
R6	ERJ3GEYJ101	100		1	R67	ERJ3GEYJ103	10K	1
R7	ERJ3GEYJ270	27		1	R68	ERJ3GEYJ473	47K	1
R8	CNJ3GCYJ105	1M		1	R69	ERJ3GEYJ153	15K	1
R9	ERJ3GEYJ101	100		1				
R10	ERJ3GEYJ101	100		1				
R11	ERJ3GEYOR00	0		1				
R12	ERJ3GCYJ153	15K		1				
R13	ERJ3GEYJ271	270		1				
R14	ERJ3GEYJ271	270		1				
R15	FR.13GFY0R00	0		1				
R16	ERJ3GEYOR00	0		1				
R17	ERJ3GEYJ472	4.7K		1				

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Part Name & Description & Value	Pcs
R89	PQ4R10XJ472	4.7K	S 1			(COMPONENTS PARTS)	
R90	ERJ3GEYJ101	100	1	RA1	EXRV8V101JV	COMPONENTS PARTS	1
R91	ERJ3GEYJ101	100	1	RA2	EXRV8V101JV	COMPONENTS PARTS	1
R92	ERJ3GEYJ101	100	1	RA3	EXRV8V271JV	COMPONENTS PARTS	1
R93	ERJ3GEYJ101	100	1	RA4	EXRV8V271JV	COMPONENTS PARTS	1
R94	ERJ3GEYJ101	100	1	RA5	EXRV8V271JV	COMPONENTS PARTS	1
R95	ERJ3GEYJ101	100	1	RA6	EXRV8V271JV	COMPONENTS PARTS	1
R96	PQ4R10XJ562	5.6K	S 1	RA7	EXRV8V271JV	COMPONENTS PARTS	1
R97	ERJ3GEYJ203	20K	1			(CAPACITORS)	
R98	ERJ3GEYJ823	82K	1	C1	ECEA1CK101	100	S 1
R99	ERJ3GEYJ223	22K	1	C2	ECUV1H160JCV	15P	1
R100	ERJ3GEY0R00	■	1	C3	ECUV1H104ZVF	0.1	S 1
R101	ERDS1V152	1.5K	1	C4	ECUV1H104ZVF	0.1	S 1
R102	ERJ3GEYJ821	820	1	C5	ECUV1H150JCV	15P	1
R103	PQ4R10XJ561	560	S 1	C6	ECUV1H104ZVF	0.1	S 1
R104	ERJ3GEYJ1R0	1	1	C7	ECUV1H104ZVF	0.1	S 1
R105	ERJ3GEYJ103	10K	1	C8	ECUV1H104ZVF	0.1	S 1
R106	ERJ3GEYJ224	220K	1	C9	ECUV1H104ZVF	0.1	S 1
R107	ERJ3GEYJ224	220K	1	C10	PQCUV1E104MD	0.1	1
R108	ERJ3GEYJ103	10K	1	C11	ECUV1H104ZVF	0.1	S 1
R109	ERJ3GEYJ100	10K	1	C12	CCUV1H1330JCV	33P	1
R110	ERJ3GEYJ473	47K	1	C14	ECUV1H100DCV	10P	1
R111	FRJ3GFYJ103	10K	1	C15	ECUV1H080DCV	8P	1
R112	ERJ3GEYJ103	10K	1	C16	ECUV1H104ZVF	0.1	S 1
R113	ERJ3GEYJ153	15K	1	C18	ECUV1H102KBV	0.001	1
R114	PQ4R10XJ102	1K	S 1	C19	ECUV1H104ZVF	0.1	S 1
R115	ERJ3GEYJ102	1K	1	C20	ECUV1H104ZVF	0.1	S 1
R116	FRJ3GFYJ473	47K	1	C21	ECUV1H104ZVF	0.1	S 1
R117	ERJ3GEYJ473	47K	1	C23	ECUV1H104ZVF	0.1	S 1
R118	ERJ3GEYJ101	100	1	C24	ECUV1H104ZVF	0.1	S 1
H119	EHJ3GEYUH00	0	1	C25	ECUV1H104ZVF	0.1	S 1
R121	FRJ3GFYJ302	3.8K	1	C26	ECUV1H104ZVF	0.1	S 1
R122	ERJ3GEYJ302	3.8K	1	C27	ECUV1H104ZVF	0.1	S 1
R123	ERJ3GEYJ102	1K	1	C28	ECUV1H100DCV	10P	1
R124	ERJ3GEYJ102	1K	1	C29	ECUV1H104ZVF	0.1	S 1
R125	ERJ3GEY0R00	0	1	C30	ECUV1H104ZVF	0.1	S 1
R126	FRJ3GFYJ331	330	1	C31	ECUV1H104ZVF	0.1	S 1
R127	ERJ3GEY0R00	0	1	C32	ECUV1H104ZVF	0.1	S 1
R128	ERJ3GEY0R00	0	1	C33	PQCUV1C224ZF	0.22	1
R129	PQ4R10XJ000	0	1	C34	ECUV1H104ZVF	0.1	S 1
R130	ERJ3GEYJ821	820	1	C36	ECEA1CKS100	10	S 1
R131	ERJ3GEYJ331	330	1	C37	ECEA1CKS100	10	S 1
R132	ERJ3GEY0R00	0	1	C38	ECEA0IK021	220	S 1
H133	EHJ3GEYUH00	0	1	C39	PQCUV1E104MD	0.1	S 1
		(WINDINGS)		C40	PQCUV1E104MD	0.1	S 1
L1	PQLQR1ET	COIL	1	C41	PQCUV1E104MD	0.1	S 1
L2	PQLQR2N3R0K	COIL	1	C42	ECUV1H102KBV	0.001	1
L3	PQLQR1ET	COIL	1	C43	ECUV1H050CCV	5P	S 1
L4	PQLQR1KT	COIL	1	C44	ECUV1H050CCV	5P	S 1
L7	PQLQR1RM601	COIL	1	C45	ECEA1CKS100	10	S 1
L8	PQLQR1RM601	COIL	1	C47	ECUV1H104ZVF	0.1	S 1
L9	PQLQR1RM601	COIL	1	C48	ECUV1H104ZVF	0.1	S 1
L10	PQLQR1RM601	COIL	1	C49	ECUV1H104ZVF	0.1	S 1
L11	PQLQR1RM601	COIL	1	C51	ECEA1CKS470	47	S 1
L12	PQLQR1RM601	COIL	1	C52	ECUV1H102KBV	0.001	1
L14	PQLQR2KA20T	COIL	1	C53	ECUV1H102KBV	0.001	1
L15	PQLQR2KB113T	COIL	1	C54	CCUV1C104KDV	0.1	1
L19	PQLQR2KB113T	COIL	1	C55	ECUV1H332KBV	0.0033	1
				C56	ECUV1H102KBV	0.001	1
				C59	ECUV1C104KBV	0.1	1

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Part Name & Description	Pcs
ANALOG BOARD PARTS							
C61	ECUV1C104KBV	0.1	1	PCB2	PFLP1114ALZ	ANALOG BOARD ASSY(RTL) △	1
C64	ECUV1H71JCV	470P	1			(ICs)	
C66	PQCUV1H273MD	0.027	S 1	IC1	AN6382NFA	IC	1
C68	ECUV1H331JCV	330P	1	IC2	PQVIMT3274AE	IC	1
C69	PQCUV1C224KB	0.22	S 1	IC4	PQVINJM4568M	IC	1
C70	PQCUV1C224KB	0.22	S 1	IC5	PQVINJM2903M	IC	1
C71	ECEA1CK101	100	S 1	IC6	PQVITC4052BF	IC	1
C72	PQCUV1C224KB	0.22	S 1				
C73	ECEA1CK101	100	S 1				
C74	PQCUV1E104MD	0.1	S 1				
C75	ECUV1H104ZPV	0.1	S 1				
C76	ECEA1CKS100	10	S 1				
C77	ECEA1CKS100	10	S 1				
C78	PQCUV1H105JC	1	S 1				
C79	PQCUV1H105JC	1	S 1				
C80	ECUV1H681KBV	680P	1				
C81	ECUV1H681KBV	680P	1				
C82	ECEA1CKS470	47	S 1				
C83	ECUV1H102KBV	0.001	S 1				
C84	PQCUV1H105JC	1	S 1				
C85	PQCUV1H105JC	1	S 1				
C86	PQCUV1E104MD	0.1	S 1				
C88	ECUV1H681JCV	680P	1				
C90	PQCUV1E104MD	0.1	S 1				
C91	ECUV1C104KBV	0.1	S 1				
C92	ECEA0.1KA331	330	1				
C93	ECUV1H102KBV	0.001	1				
C94	ECUV1H102KBV	0.001	1				
C95	ECUV1C104KBV	0.1	1				
C96	PQCUV1H473MD	0.047	1				
C97	ECUV1H222KBV	0.0029	1				
C98	ECUV1H661JCV	680P	1				
C103	ECUV1H470JCV	47	1				
C106	ECUV1H104ZPV	0.1	S 1	D1	ISS131	DIODE(SI)	1
C107	ECEA1CK101	100	S 1	D2	PQVDS17R40F1	DIODE(SI)	1
C108	ECUV1H104ZPV	0.1	S 1	D4	MA700A	DIODE(SI)	1
C109	ECUV1H104ZPV	0.1	S 1	D6	ISS131	DIODE(SI)	1
C110	ECEA1CKS100	10	S 1	D8	ISS131	DIODE(SI)	1
C111	ECUV1H104ZPV	0.1	S 1	D7	PQVDHZS2B1	DIODE(SI)	1
C112	ECUV1H104ZPV	0.1	S 1	D9	MA4056	DIODE(SI)	1
C113	ECUV1H104ZPV	0.1	S 1	D10	MA4056	DIODE(SI)	1
C114	ECEA1CK101	100	S 1	DA1	MA143	DIODE(SI)	1
C115	ECEA1VKA470	47	1	DA2	MA143	DIODE(SI)	1
C118	PQCUV1C224Z	0.22	1	DA3	MA143	DIODE(SI)	1
C117	ECEA1CKS100	10	S 1				
C119	ECUV1H104ZPV	0.1	S 1				
C120	PQCUV1E104MD	0.1	S 1				
C123	ECUV1C473KBV	0.047	1				
C124	ECUV1H102KBV	0.001	1	CN1	PFJJ1T01Z	JACK	S 1
C125	ECUV1H102KBV	0.001	1				
C132	ECUV1H102KBV	0.001	1				
C133	ECUV1H102KRV	0.001	1				
C135	ECUV1H172KBV	0.0047	1				
C136	PQCUV1H104ZF	0.1	1	CN3	PQJP6G30Y	CONNECTOR, 8P	1
C137	ECUV1H472KBV	0.0047	1	CN4	PQJP2G30Z	CONNECTOR, 2P	1
C138	ECUV1H104ZPV	0.1	S 1	CN6	PQJS16A10Z	CONNECTOR, 16P	1
		(CRYSTAL OSCILLATORS)		CN7	PQJS16A10Z	CONNECTOR, 16P	1
X1	PFVCCSA24Z	CRYSTAL OSCILLATOR	1				
X2	PFVCCFS32Z	CRYSTAL OSCILLATOR	1				
X3	PFVC5376Z	CRYSTAL OSCILLATOR	1				
		(SWITCHES)					
SW1	POSS2A977	SWITCH	1				
SW3	PFSH1A03Z	SWITCH	1				
SW4	PFSH1A03Z	SWITCH	1				

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Value	Pcs
		(COILS)	S	R10	ERJ3GEYJ332	3.3K	1
L2	PQLQR1E32A07	COIL	1	R12	ERDS2TJ102	1K	1
L3	POLOR1E32A07	COIL	1	R13	PQ4R10XJ333	33K	S 1
L6	PQLQR1RM601	COIL	S 1	R14	Not Used		
L7	PQLQR1RM601	COIL	S 1	R15	ERJ3GEYJ333	33K	1
L8	PQLQR1HM601	COIL	S 1	R16	Not Used		
L9	PQLQR1RM601	COIL	S 1	R17	ERJ3GEYJ123	12K	1
L10	POIQR2KB113T	COIL	S 1	R18	ERDS2TJ221	220	1
L11	PQLQR2KB113T	COIL	1	R19	Not Used		
LH1	PFL003	COIL	S 1	R20	ERDS2TJ221	220	1
		(CERAMIC FILTER)		R21	ERJ3GEYJ472	4.7K	1
X1	PQVB14.19G2	CERAMIC FILTER	1	R22	Not Used		
		(COMPONENTS PARTS)		R23	ERDS1TJ150	15	1
L1	EXCELDH35	COMPONENTS PARTS	1	R24	ERJ3GEYJ472	4.7K	1
		(PHOTO COUPLERS)		R25	ERJ3GEYJ432	4.3K	1
PC1	PQVIPS2532-1	PHOTO ELECTRIC TRANSDUCER △ S	1	R26	ERJ3GEYJ183	18K	1
PC2	PQVIPC817CD	PHOTO ELECTRIC TRANSDUCER △	1	R27	ERJ3GEYJ561	560	1
PC3	Not Used			R28	ERJ3GEYJ184	100K	1
PC4	PQVIPS2532-1	PHOTO ELECTRIC TRANSDUCER △ S	1	R29	ERJ3GEYJ562	5.6K	1
PC5	PQVIPC817CD	PHOTO ELECTRIC TRANSDUCER △	1	R30	ERJ3GEYJ224	220K	1
PC6	PQVITLP620K	PHOTO ELECTRIC TRANSDUCER △	1	R31	ERJ3GEYJ272	2.7K	1
PC8	PQVITLP620K	PHOTO ELECTRIC TRANSDUCER △	1	R32	ERJ3CCYJ024	620K	1
		(TRANSFORMER)		R33	ERJ3GEYJ562	5.6K	1
T1	PFLT8E003	TRANSFORMER	△	R34	ERJ3GEYJ562	5.6K	1
I2	PFLT8E004	TRANSFORMER	△	R35	ERJ3GEYJ123	12K	1
		(RELAY)		R36	ERJ3GEYJ222	2.2K	1
HLY1	ATXD020328	RELAY	△	R37	ERJ3CCYJ273	27K	1
				R38	ERJ3GEYJ222	2.2K	1
		(THERMISTOR)		R39	ERJ3GEYJ563	56K	1
POS1	PFRT002	THERMISTOR	1	R40	ERJ3GEYJ563	56K	1
		(RESISTORS)		R41	ERJ3CCYJ104	100K	1
J120	PQ4R18XJ000	0	1	R42	ERJ3GEYJ104	100K	1
J122	ERJ3GEY0R00	0	1	R43	ERJ3GEYJ103	10K	1
J123	ERJ3GEY0R00	0	1	R44	ERJ3GEYJ104	100K	1
J124	CRJ3CCY0R00	0	1	R45	ERJ3GEYJ103	10K	1
J125	ERJ3GEY0R00	0	1	R46	ERJ3CCYJ103	10K	1
J126	ERJ3GEY0R00	0	1	R47	ERJ3CCYJ103	10K	1
J128	ERJ3GEY0R00	0	1	R48	ERJ3GEYJ103	10K	1
J127	ERJ3GEY0R00	0	1	R49	ERJ3GEYJ474	470K	1
J131	PQ4R10XJ000	0	1	R50	ERJ3GEYJ472	4.7K	1
J132	PQ4R10XJ000	0	1	R51	ERJ3CCYJ502	5.0K	1
JP14	ERJ3GEY0R00	0	1	R52	ERJ3GEYJ104	100K	1
		(RESISTORS)		R53	ERJ3GEYJ104	100K	1
J120	PQ4R18XJ000	0	1	R54	ERJ3GEYJ474	470K	1
J122	ERJ3GEY0R00	0	1	R55	ERJ3GEYJ174	170K	1
J123	ERJ3GEY0R00	0	1	R56	ERJ3GEYJ333	33K	1
J124	CRJ3CCY0R00	0	1	R57	ERDS1TJ473	47K	1
J125	ERJ3GEY0R00	0	1	R58	ERDS1TJ153	15K	1
J126	ERJ3GEY0R00	0	1	R59	ERJ3GEYJ331	330	1
J127	ERJ3GEY0R00	0	1	R60	ERJ3GEYJ152	1.5K	1
J131	PQ4R10XJ000	0	1	R61	ERJ3GEYJ152	1.5K	1
J132	PQ4R10XJ000	0	1	R62	ERJ3GEYJ123	12K	1
JP14	ERJ3GEY0R00	0	1	R63	ERJ3GFYJ153	15K	1
R1	ERDS2TJ271	270	1	R64	ERJ3GEYJ153	15K	1
	ERDS2TJ472	4.7K	1	R65	ERJ3GEYJ100	10	1
	ERJ3GEYJ104	100K	1	R66	ERJ3GEYJ103	10K	1
R4	ERHS2TJ472	4.7K	1	R67	ERJ3GEYJ682	6.8K	1
R5	ERDS2TJ562	5.8K	1	R68	ERJ3GEYJ154	150K	1
R6	ERJ3GEYJ155	1.5M	1	R69	ERJ3GEYJ154	150K	1
R7	ERJ3GEYJ333	33K	1	R70	ERJ3GEYJ333	33K	1
R8	ERJ3GEYJ474	470K	1	R71	ERJ3GEYJ104	100K	1
R9	ERJ3GEYJ105	1M	1	R72	ERJ3GEYJ103	10K	1
				R73	ERJ3GEYJ273	27K	1
				R74	ERJ3CCYJ103	10K	1
				R75	ERJ3GEYJ274	270K	1

## KX-FT37AL

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Ref. No.	Part No.	Value	Pcs	Ref. No.	Part No.	Value	Pcs
R77	ERJ3GEYJ125	1.2M	1			(CAPACITORS)	
R78	ERJ3GEYJ104	100K	1	C2	ECKD2H681KB	680P	S 1
R79	ERJ3GEYJ023	02K	1	C3	ECKD2H661KB	680P	S 1
R80	ERJ3GEYJ563	56K	1	C4	ECUV1H103KBV	0.01	S 1
R81	ERJ3GEYJ183	18K	1	C5	ECEA1EU470	47	S 1
R82	ERJ3GEYJ105	1M	1	C6	ECEA1EKS330	33	S 1
R83	ERJ3GEYJ834	830K	1	C8	Not Used		
R86	ERJ3GEYJ562	5.6K	1	C9	ECUV1H333KDV	0.033	S 1
R87	ERJ3GEYJ000	■	1	C10	ECEA1EK470	47	S 1
R88	FR.1RGFY.I334	330K	1	C11	Not Used		
R89	ERJ3GEYJ104	100K	1	C12	ECEA1HKS4R7	4.7	S 1
R91	ERJ3GEYJ332	3.3K	1	C13	ECUV1H102KBV	0.001	S 1
R92	ERJ3GEYJ273	27K	1	C14	ECEA1HKS4R7	4.7	S 1
R93	FR.1RGFY.II23	12K	1	C15	PQCUV1C184KB	0.18	S 1
R94	ERJ3GEYJ102	1K	1	C16	PQCUV1C124KB	0.12	S 1
R95	ERJ3GEYJ102	1K	1	C17	ECCEA1HKS4R7	0.47	S 1
R96	ERJ3GEYJ102	1K	1	C18	ECUV1C163KBV	0.016	S 1
R97	ERJ3GEYJ103	10K	1	C19	ECUV1C123KBV	0.012	S 1
R98	ERJ3GEYJ393	39K	1	C20	ECUV1H331JCV	330P	S 1
R99	ERJ3GEYJ103	10K	1	C21	ECCEA1HKS010	1	S 1
R100	ERJ3GEYJ333	33K	1	C22	ECUV1H152KBV	0.0015	S 1
R101	ERJ3GEYJ154	150K	1	C23	ECUV1H333KDV	0.033	S 1
R102	ERJ3GEYJ103	10K	1	C24	ECUV1H103KBV	0.01	S 1
R103	ERJ3GEYJ004	100K	1	C25	ECUV1H933KDV	0.033	S 1
R104	ERJ3GEYJ473	47K	1	C26	ECUV1H222KDV	0.0022	S 1
R105	ERJ3GEYJ583	56K	1	C27	ECUV1C104KBV	0.1	S 1
R106	ERJ3GEYJ333	33K	1	C28	ECUV1H222KBV	0.0022	S 1
R107	ERJ3GEYJ102	1K	1	C29	ECUV1C104KBV	0.1	S 1
R108	ERJ3GEYJ333	33K	1	C30	ECUV1H621KBV	820P	S 1
R109	ERJ3GEYJ103	10K	1	C31	ECUV1H621KBV	820P	S 1
R110	ERJ3GEYJ473	47K	1	C32	PQCUV1H104ZF	0.1	S 1
R111	ERJ3GEYJ104	100K	1	C33	ECEA1CKS100	10	S 1
R112	ERJ3GEYJ223	22K	1	C34	ECEA1CKS100	10	S 1
R113	ERJ3GEYJ663	56K	1	C35	ECUV1H104ZFV	0.1	S 1
R114	ERJ3GEYJ683	68K	1	C36	ECUV1C104KBV	0.1	S 1
R115	ERJ3GEYJ103	10K	1	C37	ECEA1CKS100	10	S 1
R116	ERJ3GEYJ101	100	1	C38	ECUV1C104KBV	0.1	S 1
R117	ERJ3GEYJ472	4.7K	1	C39	ECQE2E474KZ	0.47	S 1
R118	ERJ3GEYJ101	100	1	C40	ECUV1H102KBV	0.001	S 1
R119	ERJ3GEYJ472	4.7K	1	C41	ECEA0JK221	220	S 1
R120	ERJ3GEYJ101	100	1	C42	ECUV1H103KRV	0.01	S 1
R121	ERJ3GEYJ472	4.7K	1	C43	ECUV1H103KBV	0.01	S 1
R122	ERJ3GEYJ101	100	1	C44	ECUV1H103KBV	0.01	S 1
R123	ERJ3GEYJ472	4.7K	1	C45	ECCEA1HKSU10	1	S 1
R124	PQ4R10XJ222	2.2K	1	C46	ECUV1H104ZFV	0.1	S 1
R125	ERJ3GEYJ103	10K	1	C47	ECUV1H153KRV	0.015	S 1
R126	ERJ3GEYJ103	10K	1	C48	ECUV1H153KBV	0.015	S 1
R127	ERJ3GEYJ272	2.7K	1	C49	ECEA1CKS470	47	S 1
R131	ERDS1TJ222	2.2K	1	C50	ECUV1H332KBV	0.0033	S 1
R132	ERDS1TJ222	2.2K	1	C51	ECUV1H152KBV	0.0015	S 1
R133	CRQ2SJ152	1.5K	1	C52	ECUV1C104KBV	0.1	S 1
R140	PQ4R18XJ3R3	3.3	1	C53	ECUV1H103KBV	0.01	S 1
R141	ERDS2TJ271	270	1	C54	ECEA1CK101	100	S 1
R142	ERJ3GEYJ102	1K	1	C55	ECEA1CKS100	10	S 1
R143	ERJ3GEYJ881	880	1	C57	ECUV1H121JCV	120P	S 1
R144	ERJ3GEYJ331	330	1	C58	ECUV1H1153KBV	0.015	S 1
				C59	ECUV1H101JCV	100P	S 1
				C60	ECUV1H331JCV	330P	S 1
				C61	ECUV1C104KBV	0.1	S 1
				C62	ECUV1H151JCV	150P	S 1
				C63	ECUV1H103KBV	0.01	S 1
				C64	ECUV1C104KBV	0.1	S 1
				C65	ECEA1CK101	100	S 1
				C66	ECUV1H104ZFV	0.1	S 1

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Part Name & Description & Value	Pcs
C67	ECUV1H151JCV	150P	1			(DIODES)	
C68	ECUV1C104KDV	0.1	1	D1	MA700A	DIODE(SI)	1
C72	ECUV1C473KBV	0.047	1	LED6	PQVDR325CA47	DIODE(SI)	S 1
C75	ECUV1H101JCV	100P	1	LED8	PQVDR325CA47	DIODE(SI)	S 1
C76	ECUV1H101JCV	100P	1	LED9	PQVDR325CA47	DIODE(SI)	S 1
C77	ECUV1H153KBV	0.015	1				
C78	ECUV1H101JCV	100P	1				
C79	ECUV1H101JCV	100P	1				
C80	ECEA1CK101	100	S 1			(CONNECTORS)	
C81	ECEA1CK5100	10	S 1	CN1	PQJS10X59Z	CONNECTOR, 10P	1
C82	ECUV1H103KBV	0.01	S 1	CN3	PQJP12G43Z	CONNECTOR, 12P	S 1
C83	ECUV1H104ZVF	0.1	S 1				
C84	POCUV1H105JC	1	S 1				
C85	ECUV1C104KDV	0.1	1			(PHOTO ELECTRIC TRANSDUCERS)	
C86	ECUV1H222KBV	0.0022	1	PS1	CNA1006N	PHOTO ELECTRIC TRANSDUCER	S 1
C87	ECUV1H102KBV	0.001	1	PS2	CNA100GN	PHOTO ELECTRIC TRANSDUCER	S 1
C88	ECUV1H222KBV	0.0022	1	PS3	CNA1006N	PHOTO ELECTRIC TRANSDUCER	S 1
C89	ECUV1H821KBV	820P	1				
C90	ECUV1H151JCV	150P	1				
C91	ECUV1H223KBV	0.022	S 1				
C92	ECUV1H223KBV	0.022	S 1				
C93	ECUV1H333KDV	0.093	S 1			(RESISTORS)	
C95	ECUV1H1002KDV	0.0000	1	J24	PQ4R18XJ000	0	1
C96	ECUV1C104KBV	0.1	1	J37	PQ4R10XJ000	0	1
C97	ECUV1C104KBV	0.1	1	J70	PQ4R10XJ000	0	1
C99	ECUV1H103KBV	0.01	1	J71	PQ4HTUXJ000	0	1
C100	ECUV1H103KDV	0.01	1	J73	PQ4R10XJ000	0	1
C101	ECUV1H103KBV	0.01	1	J74	PQ4R10XJ000	0	1
C102	PQCUV1H103KB	0.01	1	J75	PQ4R10XJ000	0	1
C103	ECEA1HKS010	1	S 1	J80	PQ4H10XJ000	0	1
C104	PQCUV1H104ZF	0.1	1	J82	PQ4R18XJ000	0	1
C105	PQCUV1H104ZF	0.1	1	J83	PQ4R10XJ000	0	1
C106	ECEA1HKS100	10	S 1	J84	PQ4R18XJ000	0	1
C107	ECEA1EKS330	33	S 1	J85	PQ4R18XJ000	0	1
C108	ECUV1H104ZVF	0.1	S 1	J86	PQ4R18XJ000	0	1
C109	ECUV1H104ZVF	0.1	S 1	J87	PQ4R18XJ000	0	1
C110	ECEA1EKS330	33	S 1	J88	PQ4R18XJ000	0	1
C111	PQCUV1H104ZF	0.1	1	J89	PQ4R18XJ000	0	1
C112	ECEA1CK101	100	S 1	J90	PQ4R18XJ000	0	1
C113	ECUV1H104ZVF	0.1	S 1	J92	PQ4R18XJ000	0	1
C114	ECEA0JK221	220	S 1	J95	PQ4R10XJ000	0	1
C123	ECUV1H102KBV	0.001	1	R2	PQ4R10XJ000	0	1
		(VARIATORS)		R12	PQ4R10XJ271	270	S 1
SA1	PQVDRA811PT3	VARIATOR	1	R14	PQ4R10XJ271	270	S 1
SA2	PFRZ001Z	VARIATOR	A 1	R15	PQ4R10XJ271	270	S 1
ZNR1	ERZVA7D121	VARIATOR	1	R19	PQ4R10XJ182	1.8K	S 1
				R20	PQ4R10XJ331	330	S 1
				R21	PQ4R10XJ332	3.3K	S 1
				R22	PQ4R10XJ569	56K	S 1
				R24	PQ4R10XJ182	1.8K	S 1
				R25	PQ4R10XJ331	330	S 1
				R26	PQ4R10XJ331	330	S 1
				R27	PQ4R10XJ569	56K	S 1
				R28	PQ4R10XJ569	56K	S 1
				R29	PQ4R10XJ181	180	S 1
				R31	PQ4R10XJ181	180	S 1
				R33	PQ4R10XJ181	180	S 1
				R35	PQ4R10XJ181	180	S 1
				R37	PQ4R10XJ182	1.8K	S 1
				R38	PQ4R10XJ181	180	S 1

## KX-FT37AL

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Part Name & Description & Value	Pcs				
HANDSET BOARD											
R39	PQ4R10XJ181	180	S 1	PCB4	PFI P1109BXZ	HANDSET BOARD ASS'Y (RTL)	1				
R40	PQ4R10XJ181	180	S 1			(CONNECTORS)					
R42	PQ4R10XJ181	180	S 1	CN9	PQJP6G30Y	CONNECTOR, 6P	1				
R43	PQ4R10XJ181	180	S 1	CN10	PQJJ1TB18Z	CONNECTOR, 1P	1				
R44	PQ4R10XJ181	180	S 1			(SWITCH)					
R46	PQ4R18XJ181	180	S 1	SW5	ES14A211	SWITCH	1				
R50	PQ4R10XJ181	160	S 1								
R55	PQ4R10XJ181	180	S 1								
R57	PQ4R10XJ000	0	S 1								
		(CAPACITORS)									
C4	PQCUV1E104MD	0.1	S 1								
C6	PQCUV1E104MD	0.1	S 1								
C7	PQCUV1H105JC	1	S 1								
C8	PQCUV1H105JC	1	S 1								
C11	PQCUV1H331JC	330P	S 1	POWER SUPPLY BOARD PARTS							
C12	PQCUV1H331JC	330P	S 1	PCB5	ETXKM183E3B	POWER SUPPLY BOARD ASS'Y A (RTL)	1				
C13	PQCUV1H331JC	330P	S 1			(TRANSISTORS)					
C14	PQCUV1H331JC	330P	S 1	C101	2SK2700	TRANSISTOR(SI)	1				
C16	PQCUV1H122KB	0.0012	S 1	C102	2SD1429A-R	TRANSISTOR(SI)	1				
C17	ECEA1AKS221	220	S 1	C201	2SC3311A	TRANSISTOR(SI)	1				
C18	PQCUV1H105JC	1	S 1			(DIODES)					
C21	PQCUV1H105JC	1	S 1	D101	PQVDERA1506	DIODE(SI)	1				
C22	PQCUV1H105JC	1	S 1	D102	PQVDERA1506	DIODE(SI)	1				
		(SWITCHES)		D103	PQVDERA1506	DIODE(SI)	1				
SW1	EVQ11Y05B	SWITCH	1	D104	PQVDERA1506	DIODE(SI)	1				
SW2	EVQ11Y05B	SWITCH	1	D105	PFVDERA220B	DIODE(SI)	1				
SW3	FVQ11Y05B	SWITCH	1	D106	MA165	DIODE(SI)	1				
SW4	EVQ11Y05B	SWITCH	1	D107	MA165	DIODE(SI)	1				
SW5	EVQ11Y05B	SWITCH	1	D108	MA165	DIODE(SI)	1				
SW6	EVQ11Y05B	SWITCH	1	D201	MA6D49	DIODE(SI)	1				
SW7	EVQ11Y05B	SWITCH	1	D301	PFVD21DQ04	DIODE(SI)	1				
SW8	FVQ11Y05B	SWITCH	1	ZD101	MA4051NM	DIODE(SI)	1				
SW9	EVQ11Y05B	SWITCH	1	ZD202	MA4062NMHM	DIODE(SI)	1				
SW10	EVQ11Y05B	SWITCH	1	ZD203	MA/2/0B	DIODE(SI)	1				
SW11	EVQ11Y05B	SWITCH	1			(CONNECTORS)					
SW13	FVQ11Y05B	SWITCH	1	CN1	PQJP2D98Z	CONNECTOR, 2P	1				
SW14	EVQ11Y05B	SWITCH	1	CN2	PQJP7G43Z	CONNECTOR, 7P	1				
SW15	EVQ11Y05B	SWITCH	1			(COILS)					
SW16	EVQ11Y05B	SWITCH	1	L101	ELF15N006A	COIL	1				
SW17	EVQ11Y05B	SWITCH	1	L102	PQLE53	COIL	1				
SW18	FVQ11Y05B	SWITCH	1	L201	PQLE53	COIL	1				
SW19	EVQ11Y05B	SWITCH	1			(VARISTORS)					
SW21	EVQ11Y05B	SWITCH	1	ZNR101	ERZVGAD751	VARISTOR	▲ 1				
SW22	EVQ11Y05B	SWITCH	1	ZNR102	ERZVGAD751	VARISTOR	▲ 1				
SW23	FVQ11Y05B	SWITCH	1								
SW24	EVQ11Y05B	SWITCH	1								
SW25	EVQ11Y05B	SWITCH	1								
SW26	EVQ11Y05B	SWITCH	1								
SW27	EVQ11Y05B	SWITCH	1								
SW28	EVQ11Y05B	SWITCH	1								
SW29	EVQ11Y05B	SWITCH	1								
SW30	EVQ11Y05B	SWITCH	1								
SW60	EVQVEHF1712B	SWITCH	1								

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Ref. No.	Part No.	Part Name & Description & Value	Pcs	Ref. No.	Part No.	Part Name & Description	Pcs
(PHOTO COUPLER)							
PC101	ON3171S	PHOTO ELECTRIC TRANSDUCER ▲	1	EC1	PQZZ6K7Z	CONNECTOR, 6P	1
		(RESISTORS)		EC2	PQZZ2K6Z	CONNECTOR, 2P	1
R101	ERDS1TJ474	470K	1	EC3	PQZZ5K13Z	CONNECTOR, 5P	1
R102	ERDS2TJ204	200K	1	EC4	PQZZ2K02	CONNECTOR, 2P	1
R103	ERDS2TJ204	200K	1	EC5	PQZZ2K6Z	CONNECTOR, 2P	1
R104	ERDS2TJ333	33K	1	EC6	PQZZ12K4Z	CONNECTOR, 12P	1
R105	ERG12SJ470	47	1	FC7	PF7713K1Z	CONNECTOR, 13P	2
R106	ERDS2TJ271	270	1	EC8	PQZZ2K13Z	CONNECTOR, 2P	1
R107	ERDS1TJ391	390	1	EC9	PF7712K1Z	CONNECTOR, 12P	1
R108	EROS2TKF0251	8.25K	1	EC10	PQZZ2K13Z	CONNECTOR, 2P	1
R109	EROS2TKF1962	19.6K	1	EC11	PO777K5Z	CONNECTOR, 7P	1
R110	ERDS2TJ223	22K	1	EC12	PQZZ2K6Z	CONNECTOR, 2P	1
R112	CNC2SJ104	100K	1	EC21	PF77131BX	SPRING HEIGHT TOOL (See page 92)	1
R113	ERDS2TJ682	6.8K	1				
R117	ERDS2TJ204	200K	1				
R118	ERDS2TJ204	200K	1				
R119	ERG2SJ104	100K	1				
R201	ERDS1TJ272	2.7K	1				
R202	ERDS2TJ271	270	1				
R203	ERDS2TJ471	470	1				
R204	ERDS2TJ562	5.6K	1				
R205	CNC2TKF0321	3.32K	1				
R206	ER052TKF4221	4.22K	1				
R207	ER052TKF4221	4.22K	1				
R210	ERG2SJ272	2.7K	1				
R211	CNC2SJ272	2.7K	1				
R212	ERDS2TJ682	6.8K	1				
R301	ERDS1TJ561	560	1				
R302	ERDS2TAJR51	0.51	1				
(CAPACITORS)							
C101	ECQU2A474MG	0.47	▲	1			
C104	PFCKDKH222M	0.0022	▲	1			
C105	PFCKDKH222M	0.0022	▲	1			
C106	ECQU2A474MG	0.47	▲	1			
C108	PFCKDKH332M	0.0033	▲	1			
C109	ETLTD2C0560B	58	▲	1			
C110	ECQB1H123JF	0.012		1			
C111	ECQB1H472JF	0.0047		1			
C112	PFCKDE2SL470	47P		1			
C113	PFCKDE1R102K	0.001		1			
C118	PFCKDKH332M	0.0033	▲	1			
C119	ECQB1H122JF	0.0012		1			
C201	PFCKDR5C222K	0.0022		1			
C202	EEUFC1V031	330		1			
C203	ECQB1H682JF	0.0068		1			
C206	ECQB1H101KF	100P		1			
C301	EEUFC1C181	180		1			
(OTHERS)							
F101	PFBAHU215315	FUSE	▲	1			
T101	ETB29AC1B8AC	TRANSFORMER	▲	1			
TH101	PFRTCS113BH0	THEHMISTOR	▲	1			

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